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POLYGALA GRANDIFLORA (POLYGALACEAE) WALTER RE-EXAMINED

CLIFTON E. NAUMAN

Department of Biological Sciences, Florida Atlantic University, Boca Raton, FL 33431

ABSTRACT

A new interpretation of the *Polygala grandiflora* complex is presented based upon morphological, statistical, distributional, cytological, and palynological evidence. Evidence indicates that the complex consists of a single species with three infraspecific taxa. A probable phylogeny, descriptions, and a key to members of the complex are provided. The new combination *Polygala grandiflora* subsp. *krugii* (Chodat) Nauman is proposed.

Polygala grandiflora Walter consists of a complex of infraspecific taxa which have been treated in a number of ways by previous authors. Chodat (1893) recognized nine taxa, five species and at least four varieties, which may now be attributed to this complex. The complex has been construed as consisting of two or more distinct species including *P. krugii* Chodat and *P. grandiflora*, the latter represented by three varieties. This treatment was followed by Blake (1924) and more recently by Long and Lakela (1971). Small (1933) treated the complex as a separate genus, *Asemeia* Raf., containing four species. A more recent treatment of the *P. grandiflora* complex was presented by Gillis (1975) for Bahamian material in which only one species and two varieties were recognized.

The question of which treatment is best still remains, as stated by Gillis (1975, p. 40), "The whole complex of *Polygala grandiflora* needs thorough biosystematic study." My investigation presents another interpretation of the complex based on more complete morphological, statistical, ecological, distributional, cytological, and palynological evidence.

More than 1100 specimens were examined in the field and herbaria. Types and general collections were borrowed from the following institutions: ALA, BM, DUKE, FAU, FSU, FTG, GA, GH, K, LL, MISS, MO, NLU, NY, SMU, TENN, TEX, UNC, US, USF, UWFP. In the systematic treatment only specimens representing the geographic range are cited.

Drawings were made from xerographic reproductions and photographs. Two mounting procedures were used for pollen preparations, acetolysis technique of Erdtman (1952) and fresh mounting in Euparal; the terminology is largely that of Erdtman (1952). Mitotic chromosome counts are based on stem tips stained by the Feulgen technique and squashed in 45% acetic acid. Meiotic counts are based on anthers squashed in aceto-orecin. Voucher specimens for chromosome counts, palynological, and morphological

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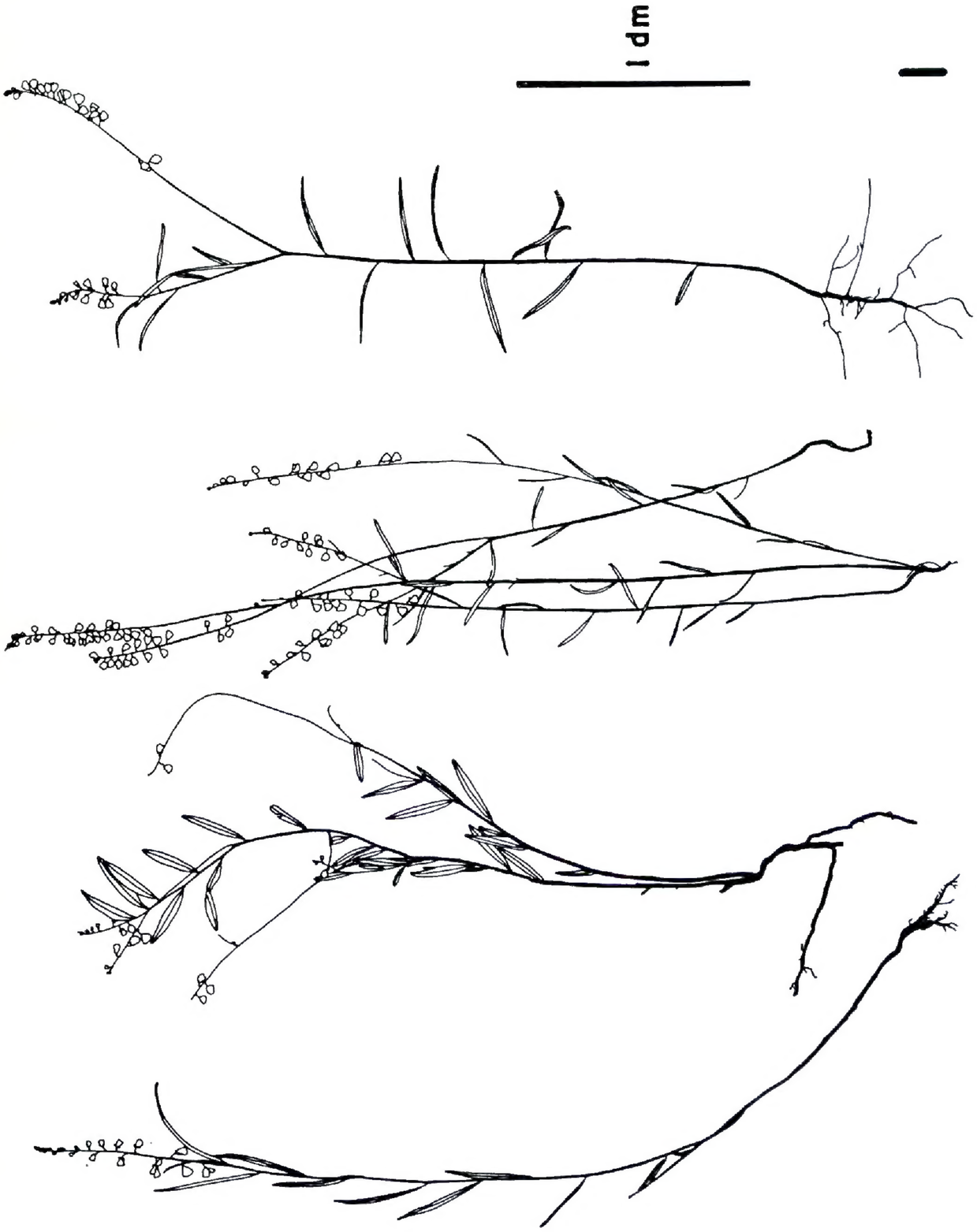

Figure 1. Habit of *Polygala grandiflora* var. *angustifolia.*

Figure 2. Habit of *Polygala grandiflora* var. *grandiflora*.

ring largely in overall size, in trichome type on the outer sepal margins, and in coloration of the wings and corolla.

Wing length/width ratios show no significant differences among the taxa, averaging 1.147. Individually wing lengths and widths show differences among the taxa exhibiting a gradation from larger to smaller wings from variety *grandiflora* to variety *angustifolia* to subspecies *krugii* (Fig. 4). A similiar gradation in size occurs in the length of the upper sepals. Average upper sepal lengths range from 2.37 mm in variety *grandiflora* to 2.06 mm in variety *angustifolia* to 1.78 mm in subspecies *krugii*.

The outer sepal margins range from glandular-ciliate to ciliate in all three taxa with a mixture of glandular and non-glandular trichomes being most frequent. Variety *angustifolia* shows a tendency for more plants to possess glandular trichomes only, subspecies *krugii* a tendency toward non-glandular trichomes only, and variety *grandiflora* a tendency toward a mixture.

In addition to the overall background color of the wings, the veins show varying degrees of purple coloration which contrasts with the background color giving the wings a reticulated appearance. The pigmentation is especially noticeable during fruiting when the wings may lose most of the background color. All three taxa exhibit a range from non-reticulated (veins lacking any visible purple coloration) to strongly reticulated (veins decidedly dark purple). Reticulation is only useful for determinations when used in combination with other characters. An overall darker pigmentation of the other flower parts is usually associated with the reticulated condition.

Seed lengths, widths, and length/width ratios demonstrate gradations among the taxa but are of little value in identification due to wide range overlaps (Fig. 4).

The seedlings are indistinguishable among the taxa. Germination is of the typical epigeal type. Cotyledons are narrowly ovate-oblong to elliptic with an acute base and obtuse tip. Hypocotyls are sometimes more densely pubescent in variety *grandiflora*. When present, trichomes are of the incurved type.

Pollen in all three taxa are 13–17 polycolporate, isopolar monads, circular in polar view and circular to elliptic in equatorial view. Each apocolpium has irregularly circular, apeturoid depressions about 1.2 μm in diameter and occasionally "fissure-like" depressions, 1.5 μm or less in width and several microns in length. The exine is 1.5–3.0 μm in thickness (in acetolyzed material). Sexine and nexine are indistinct. Intine is a darker brown color in acetolyzed material.

Variety *angustifolia* and subspecies *krugii* both demonstrated statistically significant differences ($p < 0.001$ from variety *grandiflora* in equatorial axis length, although frequency distributions indicated similar modal values for all three taxa, about 32 μm. Both varieties of subspecies *grandiflora* differed statistically from subspecies *krugii*, but not from each other, in

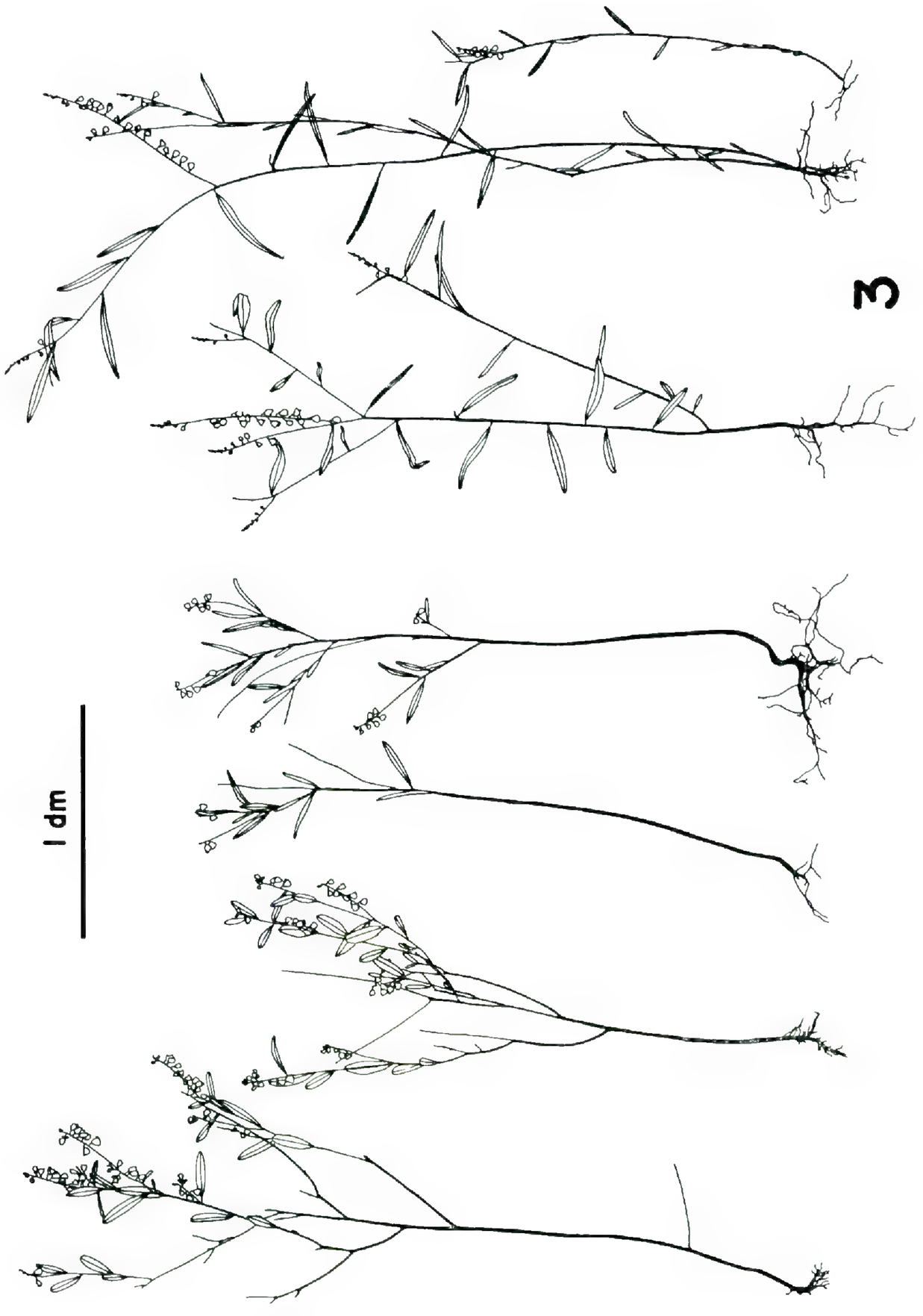

Figure 3. Habit of *Polygala grandiflora* subsp. *krugii*.

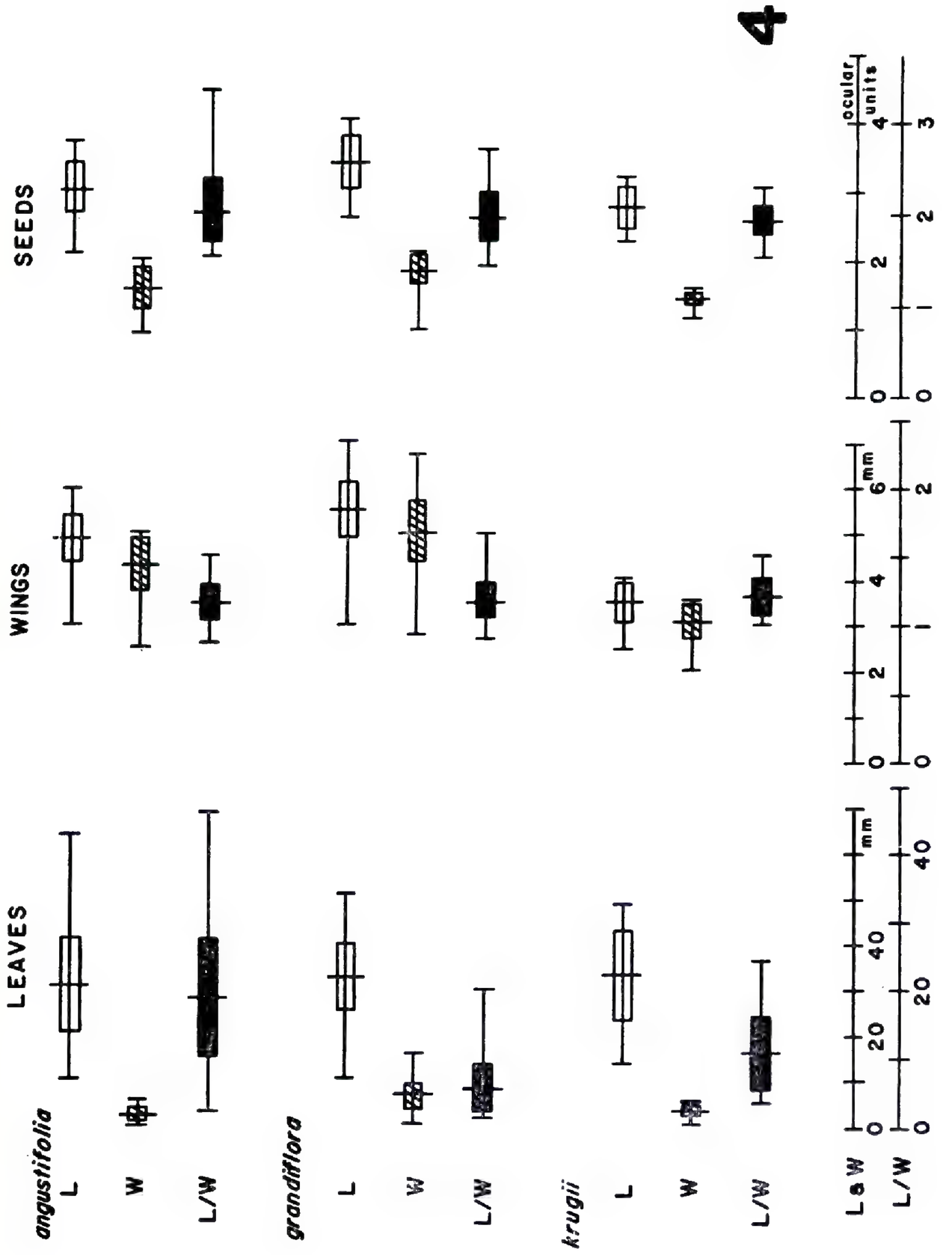

Fig. 4. Dice diagrams of leaf, wing, and seed lengths, widths, and length/width ratios in the *Polygala grandiflora* complex. (L = Length, W = Width, and L/W = Length/width ratio).

polar axis length and colpi number. Subspecies *krugii* shows a tendency toward shorter and wider pollen grains with more colpi than subspecies *grandiflora.* Average polar/equatorial axis length ratios decrease from variety *grandiflora* to variety *angustifolia* to subspecies *krugii* (1.243 to 1.194 to 1.036 respectively). Pollen is illustrated by a palynogram in Figure 5.

CYTOLOGY

Lewis and Davis (1962) reported *P. grandiflora* to be a tetraploid with n = 14, based on material from Glades County, Florida. I have examined their voucher material (*Lewis 5680*, MO, TEX) and determined it to be variety *angustifolia.* Counts in this study confirm the report of Lewis and Davis of a tetraploid with n = 14 and show 2n = 28 (*Nauman 1180, 1185,* both from Palm Beach County, Florida). No other counts are known for this species.

ECOLOGY

Both variety *grandiflora* and variety *angustifolia* occur in similar habitats, pine-oak associations, prairies, savannas, coastal dunes systems, and disturbed sites, generally dry, sandy habitats. Differences in habitat tolerances between these varieties are only obvious in extreme cases. The extreme cases for variety *grandiflora* include beach dunes and high sand ridges, mostly remnants of older types of habitats. For variety *angustifolia* the tropical pine flatwoods of southern Florida represent the extreme habitat in which vraiety *grandiflora* seldom occurs. Subspecies *krugii* occurs in open, dry habitats such as savannas, pinelands and disturbed sites.

Flowering in subspecies *krugii* occurs all year, but in subspecies *grandiflora* flowering period depends on the geographic location of the individual populations. There is a horseshoe-shaped region in the southern end of the Florida peninsula which climatologically separates the tropical and temperate regions of the state. This tropical fringe is approximated by the 12° C isotherm illustrated by Greller (1980, p. 210). Another line corresponding to this tropical fringe, but occurring north of it, delimits two different flowering periods for subspecies *grandiflora.* The second line extends from Pasco County southwesterly to Glades and Hendry Counties and then northeasterly to the Merrit Island region of Brevard County, approximating an 11° C isotherm (See Greller, loc. cit.). South of this line subspecies *grandiflora* flowers all year, but north of this line the flowering period runs from March to August. Occasional specimens will flower at other times of the year, but there is a definite difference in the peak flowering period for populations north and south of this line.

CONCLUSIONS

The large number of morphological, ecological, and palynological similarities suggest that all three taxa represent a single species. No taxon

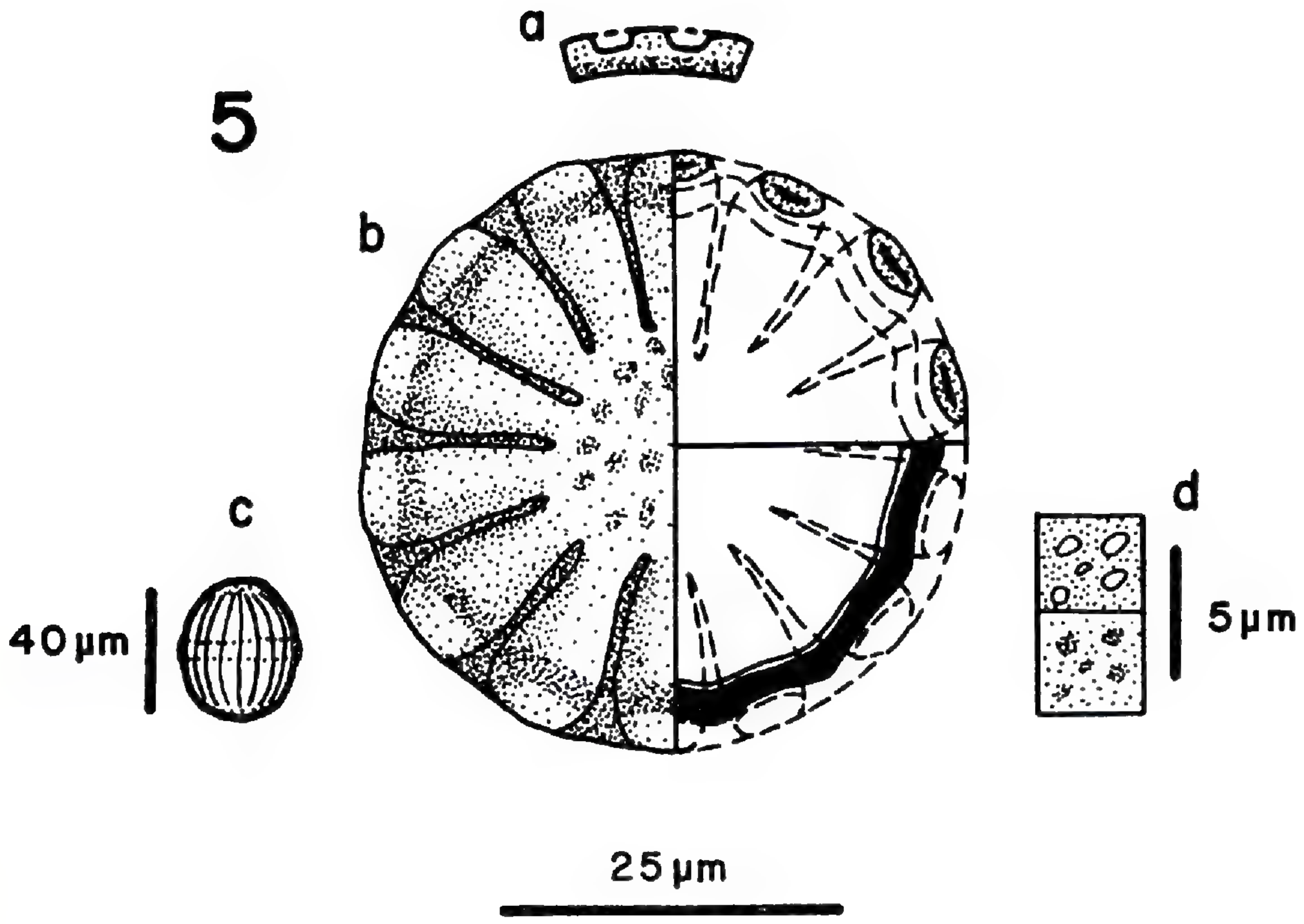

Figure 5. Palynogram for *Polygala grandiflora*. a. crossection of the apocolpium; b. polar view with crossections; c. equatorial view; d. L-O analysis.

exhibits any character state not found in one or both of the other taxa, with the exception of the spreading pubescence type which does not occur in subspecies *krugii*. Even those characters which may be used to distinguish them show intergradations or trends across all three taxa.

Twenty three characters measured on more than 525 specimens were ranged according to the method described by Sneath and Sokal (1973). Mean values of the ranged data for each character were then used to compute the Euclidean distances among the taxa in a 23-dimensional hyperspace. Correlation coefficients were also calculated as a measure of similarity. The matrices of distance values and correlation coefficients, and the phenograms resulting from single linkage clustering are given in Figure 6. The results of the phenetic comparisons correspond to the following hypothesis for the development of the *P. grandiflora* complex.

Polygala grandiflora appears to have arisen in the Coastal Plain of the southeastern United States and to have occurred there at least as early as the late Tertiary or early Quarternary Periods. According to the "Orange Island Hypothesis" a series of islands existed during that time period in

an area which is now part of the Florida peninsula (e.g. James, 1961). Populations of *P. grandiflora* may have become isolated on these island systems and diverged into a form resembling variety *angustifolia.* Sea level changes during the Miocene may have then allowed the Coastal Plain form to spread southward on to the newly emergent peninsula. Simultaneously, the formerly isolated insular populations spread southward. The renewed sympatry between these populations would then permit a renewed gene flow, possibly accounting for the morphological intermediacy in the extant populations. Before, during or after reaching the southern portions of the Florida peninsula, including the Florida Keys, some portion of the populations reached the Caribbean Islands. These populations were then isolated in a manner similar to that proposed for the early ancestors of variety *angustifolia,* ultimately giving rise to subspecies *krugii.* This subspecies appears to have arisen from ancestors more closely related to variety *angustifolia* based on the morphological similarity between these two taxa (Fig. 6).

It might be argued that subspecies *krugii* is a separate species and was present in the Caribbean prior to subspecies *grandiflora* reaching the Florida peninsula. However, the similarities between these two taxa are too great to ignore. They show similarities in every feature examined. Since subspecies *grandiflora* also occurs in the Caribbean, further argument could be made that the two populations have not been isolated long enough for divergence at the subspecific level to occur. Yet, there is a possibility that the present overlap of ranges is the result of relatively recent homovectant dispersal to and from the Caribbean Islands. The lack of variety *angustifolia* in the Bahamas and of subspecies *krugii* in Florida may be due, at least in part, to a lack of suitable habitats in both places. Colonizing ability may also be a factor. The wider distribution of variety *grandiflora* suggests it has a greater ability to colonize than the other taxa. Differences in colonizing ability become particularly relevant if homovectant dispersal is assumed to equalize the dispersal capabilities of all three taxa. As discussed by Tryon (1970), if two taxa are equal in dispersal abilities, then the taxon with the greater colonizing ability is less likely to produce endemic taxa in isolated areas because of more frequent gene flow. Since variety *angustifolia* has a narrower range than variety *grandiflora,* it is probably a less efficient colonizer and therefore a more likely candidate for the ancestor of subspecies *krugii.* It is still uncertain why variety *grandiflora* has been able to colonize where the other taxa have not. The phenograms in Figure 6 depict a probable phylogeny for the taxa within the *P. grandiflora* complex.

SYSTEMATIC TREATMENT

POLYGALA GRANDIFLORA Walter

Erect to ascending, largely perennial herbs. Root system of thick, knotty

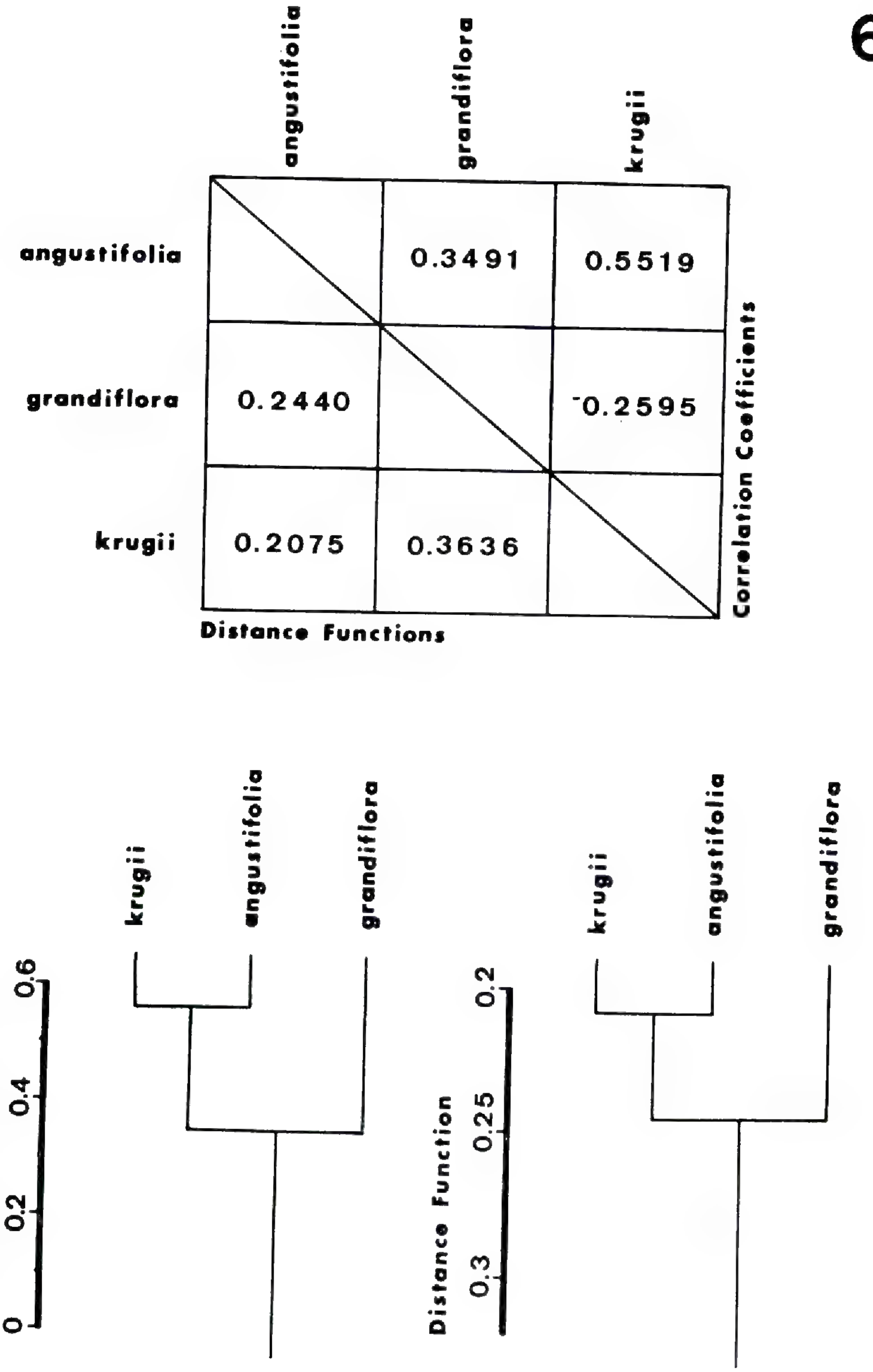

Figure 6. Phenetic analysis of the *Polygala grandiflora* complex.

tap roots or slender, fibrous roots in younger plants. Stems simple or branched, 0.75–10.0 dm tall, glabrous to tomentose with short, incurved, appressed trichomes or spreading trichomes, sometimes with a blistered or pustulate appearance. Leaves simple, alternate, entire, exstipulate, linear to ovate--rhomboid, apically acute to obtuse or rounded, occasionally mucronulate, basally acute, sometimes slightly revolute, pubescence as in the stems, texture subcoriaceous to slightly mebranous, 6–64 mm long, 0.25–15.0 mm wide, 2–46 times longer than wide. Petioles ca 1–4 mm long, slightly winged laterally or not. Inflorescence a terminal, subterminal, or axillary, arching to erect loose raceme up to ca 2 dm long, 1–2.5 cm wide; peduncles 3–17 mm long. Pedicels 1–4 mm long, articulated to the rachis. Bracts narrowly triangular, 3 per flower; 2 lateral, 0.25–0.4 mm long, cauducous bracts and 1 lower, 0.75–1.5 mm long, sometimes persistent bract. Flowers perfect, zygomorphic, pale green to deep purple with 1 free and 2 fused outer sepals, and 2 lateral inner sepals (wings), all sepals persistent. Outer, upper sepal is 1.2–3 mm long, lanceolate to lanceolate-ovate, and deltoid at the tip; lower 2 are fused to ca 3/4's their length, ovate-lanceolate with acute to deltoid or obtuse lobes; margins of the outer sepals with glandular to non-glandular trichomes. Wings 2.5–7.0 mm long, 2.0–6.5 mm wide, 0.8–1.6 times longer than wide, pale to dark purple, reticulated or not, petaloid, orbicular to quadrangular, and short-clawed. Corolla cauducous, of 2 superior, imbricate petals which are basally coalescent to a third lower petal (keel), pale to deep purple with a short, yellow throat; keel without a crest, basally pubescent. Stamens 8, fused to ca 1/2 the filament length; anthers 1-celled, apically, introrsely and poricidally dehiscent. Ovary single, superior, and bilocular. Style single, slender, bent upward with an apical stigma and subapical brush of unicellular, unbranched trichomes. Capsule 2-celled, 2-seeded, dehiscent, ovate to oblong, emarginate, slightly winged, bright to dark green, 3.25–5.25 mm long, 2–3 mm wide, sparsely pilose to glabrous at maturity, with a short stipe-like base. Seeds cylindrical to ellipsoid-cylindrical, 1.1–2.5 mm long, 0.5–0.75 mm wide, with a 3-lobed, helmet-shaped aril ca 1 mm long, densely pubescent with short, appressed, pale to golden colored trichomes. Pollen 13–17 polycolporate, isopolar monads, subspheroidal to prolate in shape, 32 μm x 37 μm.

KEY TO THE INFRASPECIFIC TAXA OF P. GRANDIFLORA

A. Stems moderately pubescent to tomentose with both incurved, appressed and loose, spreading trichomes. . . . . 1. *P. grandiflora* var. *grandiflora*

A. Stems glabrous to tomentose with incurved, appressed trichomes only. . . . B.

B. Stems and leaves glabrous to tomentose; wings pale to dark purple, 4.8 (3.0–6.0) mm long, 4.3 (2.5–5.0) mm wide, reticulate or not; upper sepals mostly with glandular trichomes . . . . . 2. *P. grandiflora* var. *angustifolia*

B. Stems and leaves glabrous; wings deep purple, 3.5 (2.5–4.0) mm long, 3.1 (2.0–3.5) mm wide, largely reticulate; upper sepals with or without glandular trichomes. . . . . 3. *P. grandiflora* subsp. *krugii*

1. POLYGALA GRANDIFLORA var. GRANDIFLORA Walter, Fl. Car. 179. 1788.

TYPE: UNITED STATES. SOUTH CAROLINA ? (HOLOTYPE: BM, not *found fide* Caumm in litt.).

P. senega rosea Michx., Fl. Bor. Amer. 2: 53. 1803.

P. pubescens Muhl., Cat. 63. 1813.

P. pubescens rosea (Michx.) Muhl., Cat. 66. 1813. nomen nudum.

P. muhlenbergii G. Don, Gen. Syst. 1: 358. 1831.

Asemeia rosea (Michx.) Raf., New Fl. 4: 88. 1838.

P. grandiflora canescens Shuttlw. ex Gray, Pl. Wright 1: 41. 1852.

P. grandiflora var. *pubescens* (Muhl.) Chodat, Monog. Polyg. 2: 57. 1893.

P. wrightii Chodat, Monog. Polyg. 2: 67, t. 13, f. 36. 1893.

TYPE: CUBA: *Wright* 112, pro parte (HOLOTYPE: Herb. Krug ex Urb.—B, possibly destroyed; ISOTYPES: K!, GH!, BM, not found fide Caumm in litt.).

P. cumulicola Small, Bull. Torrey Bot. Club 51: 381. 1924.

TYPE: UNITED STATES. FLORIDA. Dade Co.: Sand-dunes opposite Miami, 26 Nov-20 Dec 1913. *J. K. Small & G. K. Small 4568* (HOLOTYPE: NY!; ISOTYPES: FSU !, MO !, NY !, TEX !, US !; PARATYPES from the same locality: *J. K. Small 3999* NY !, *J. K. Small & G. K. Small 4575* NY !, *J. K. Small & E. W. Small 5872* NY !, TEX !, *J. K. Small & G. K. Small 6939* DUKE !, GA !, MO (2 sheets) !, NY !, SMU !, TENN !, TEX !, UNC (2 sheets) !, US (2 sheets) !).

Asemeia cumulicola (Small) Small, Man. S. E. Fl. 766. 1933.

A. grandiflora (Walter) Small, Man. S. E. Fl. 766. 1933.

Stems largely erect, 0.75–7.4 dm tall, slightly suffrutescent, moderately pubescent to tomentose with both incurved, appressed trichomes and spreading trichomes. Leaves narrowly elliptic to ovate-rhomboid, glabrous to tomentose with pubescence as in the stems, 32.9 (11.0–52.0) mm long, 6.9 (1.0–16.5) mm wide, 5.5 (2.0–20.0) times longer than wide. Upper sepals 2.4 (1.4–3.1) mm long with a mixture of glandular and non-glandular trichomes. Wings 5.5 (3.0–7.0) mm long, 5.0 (2.8–6.8) mm wide, pale purple to purple, reticulated or not. Seeds 2.0 (1.6–2.5) mm long, 1.0 (0.6–1.3) mm wide, 2.0 (1.4–2.7) times longer than wide.

Anthesis: All year in the tropical and subtropical portions of its range, March to August in the more temperate regions.

Habitat and distribution: Generally dry, sandy habitats, pine and oak associations, dunes, roadsides, savannas, and prairies; Coastal Plain from North Carolina to southern Florida, west to Louisiana, and in Cuba, the Bahama Islands, Hati, and the Dominican Republic (Fig. 7).

Additional specimens examined:

BAHAMAS. SAN SALVADOR: *Gillis 8813* (FTG). CUBA. LAS VILLAS: *Leon 9196* (US). ORIENTE: *Hioram 1940* (US). DOMINICAN REPUBLIC. LA VEGA: *Meagher 299a* (USF). MONTE CHRISTI: *Ekman H12681* (LL). PUERTO PLATA: *Raunkiaer 1018* (US). SANTIAGO: *Burch & Jimenez 2520* (USF). SANTA DOMINGO: *Allard 14379* (US). HATI. DEPT. DU NORD: *Leonard 7381* (US). DEPT. DU NORD OUEST: *Leonard & Leonard 14332* (US). DEPT. DU L'OUEST: *Leonard 4973* (US). UNITED STATES. ALABAMA. Autauga Co.: *Moore 335* (ALA). Baldwin Co.: *Burkhalter 5438* (UWFP). Barbour Co.: *Moore 448* (ALA). Butler Co.: *Clark 14596* (UNC). Choctaw Co.: *Clark 3717* (UNC). Conecuh Co.: *Correll*

& Correll 9078 (DUKE). Coosa Co.: *Rutland 1368* (ALA). Covington Co.: *Clark 14341* (UNC). Dallas Co.: *Webster & Wilbur 3507* (GA, NY, TEX, UNC). Elmore Co.: *Rutland 705* (ALA). Escambia Co.: *Moore 499-69* (ALA). Geneva Co.: *Moore 660* (ALA). Greene Co.: *Shinners 12686* (SMU). Hale Co.: *McKitrick 052* (ALA). Henry Co.: *Clark 6189* (UNC). Houston Co.: *Clark 7296* (UNC). Lee Co.: *Morris 169* (GA). Marengo Co.: *Clark 13604* (UNC). Mobile Co.: *Taylor & Taylor 13534* (NLU). Montgomery Co.: *Moore 601* (ALA). Pike Co.: *Moore 561* (ALA). Russell Co.: *Anderson 172* (ALA). Sumter Co.: *Jones 1749* (GA, UNC). Tallopoosa Co.: *Thornhill 154* (ALA). Washington Co.: *Moore 1019* (ALA). FLORIDA. Alachua Co.: *Crosby & D'Arcy 318* (USF). Brevard Co.: *Long et al. 2342* (USF). Broward Co.: *Moldenke 456* (DUKE, MO, NY). Calhoun Co.: *Grelen 79* (FSU). Charlotte Co.: *Smith 351* (USF). Clay Co.: *West & Arnold* (TEX). Collier Co.: *Wunderlin & Wunderlin 5222* (UNC, USF). Columbia Co.: *Rolfs 300* (MO). Dade Co.: *Rodgers 8936* (UNC). DeSoto Co.: *Small & DeWinkler 9539* (NY). Duval Co.: *Curtiss 513* (GA, MO, NY, SMU). Escambia Co.: *Burkhalter 6562* (UWFP). Gadsden Co.: *Anderson 4298* (FSU). Gulf Co.: *Chapman* (MO). Highlands Co.: *McFarlin 7586* (NY). Hillsborough Co.: *Wunderlin et al. 5951* (USF). Holmes Co.: *McDaniel 4847* (FSU). Indian River Co.: *Nauman & Tatje 727* (FAU). Jackson Co.: *Godfrey 63656* (USF). Jefferson Co.: *Bowers* (TENN). Lake Co.: *Moldenke & Moldenke 29804* (LL). Lee Co.: *Brumbach 9273* (NY). Leon Co.: *Correll 5567* (DUKE, GA). Levy Co.: *Kral 4495* (FSU). Liberty Co.: *"Herb. Chapman"* (MO). Madison Co.: *Carmer & Norsworthy 185* (GA, UNC). Manatee Co.: *Genelle & Fleming 1969* (USF). Marion Co.: *Ford 2265* (TENN). Martin Co.: *Bogs 63* (FAU). Monroe Co.: *Britton 106* (NY). Okaloosa Co.: *Godfrey 64376* (FSU). Orange Co.: *Schallert 15969* (SMU). Osceola Co.: *Singletary 33* (DUKE). Palm Beach Co.: *Nauman 1201* (FAU). Pasco Co.: *Cuthbert* (NY). Pinellas Co.: *Lakela 26662* (USF). Polk Co.: *Berry 183* (TENN). Putnam Co.: *Harper 1218* (UNC). Saint Johns Co.: *Reynolds* (LL, MO, NY). Saint Lucie Co.: *Brass 20529* (US). Santa Rosa Co.: *Tracy 8685* (MO, NY). Sarasota Co.: *Long & Lakela 27560* (USF). Seminole Co.: *Cooley et al 7389* (LL, USF). Sumter Co.: *Smith 468* (USF). Taylor Co.: *McDaniel & Godfrey 4309* (FSU, UNC). Volusia Co.: *Ray et al. 10815* (LL, SMU, UNC, USF). Wakula Co.: *Anderson 3936* (FSU). Walton Co.: *Moore 685* (ALA). GEORGIA. Baldwin Co.: *Hawkins* (UNC). Berrier Co.: *Duncan 11821* (GA). Blecky Co.: *Duncan & Hardin 10638* (GA). Bulloch Co.: *Boole 1152* (SMU, UNC). Chandler Co.: *Ahles 54291* (UNC). Charlton Co.: *Jones et al. 23362* (GA). Chatam Co.: *Mellinger* (MISS, SMU, UNC). Clay Co.: *Thorne 3662* (GA). Cook Co.: *Faircloth & Dean 2416* (GA, MO, UNC). Crisp Co.: *Duncan 18184* (GA). Decatur Co.: *Faircloth 147* (UNC). Dodge Co.: *Bozeman 5420* (UNC). Echols Co.: *Faircloth 5933* (GA, UNC). Glynn Co.: *Bozeman 6293* (UNC). Grady Co.: *Moldenke & Moldenke 30106* (LL). Harris Co.: *Guthrie 250* (ALA). Jefferson Davis Co.: *Jones & Reynolds 11684* (GA). Laurens Co.: *McVaugh & Pyron 3068* (GA). Lee Co.: *Duncan et al. 17139* (GA). Long Co.: *Duncan 23418* (GA). Lowndes Co.: *Faircloth 5921* (UNC). McIntosh Co.: *Correll 5469* (FSU). Miller Co.: *Duncan 6761* (GA). Mitchell Co.: *Faircloth 3786* (GA, MO, UNC). Richmond Co.: *Duke & Ahles 2032* (UNC). Screven Co.: *Ahles 54313* (UNC). Tattnall Co.: *Fitzgerald 23* (GA). Taylor Co.: *Duncan & Hardin 13612* (GA). Thomas Co.: *Clewell 2805* (FSU). Tift Co.: *Duncan et al. 17085* (GA). Toombs Co.: *Plummer & Pullen* (GA). Wayne Co.: *Coile 212* (GA). LOUISIANA. Saint Tammy Pa.: *Thomas 64892* (NLU). Tangipahoa Pa.: *Thomas et al. 23773* (NLU). Washington Pa.: *Rodgers 8058* (UNC). MISSISSIPPI. Clarke Co.: *Miller & Miller 875* (SMU). Covington Co.: *Jones 5653* (MISS). Forrest Co.: *Webster & Wilbur 3433* (GA, NY, SMU). George Co.: *Jones 17130* (MISS). Greene Co.: *Jones 8440* (MISS). Hancock Co.: *Allison 183* (MISS). Harrison Co.: *Jones & Jones 14801* (MISS). Jackson Co.: *Demaree 32241* (SMU). Jasper Co.:

Jones 14238 (MISS, NY). Jefferson Davis Co.: *Jones 5967* (MISS). Jones Co.: *Teer 151* (SMU). Lamar Co.: *McVaugh 8530* (SMU, TEX). Lauderdale Co.: *Jones 9148* (MISS). Marion Co.: *Ray 5367* (GA, NY, TENN, UNC). Noxubee Co.: *Marler* (MISS). Pearl River Co.: *Rodgers 45443* (TENN). Perry Co.: *Jones 14673* (MISS). Smith Co.: *McDaniel 3256* (NY). Walthall Co.: *Jones 8701* (MISS). Wayne Co.: *Jones & Jones 6614* (MISS). NORTH CAROLINA. Richmond Co.: *Duke 1769* (UNC). Robeson Co.: *Britt 69* (UNC). Scotland Co.: *Ahles & Haesloop 28626* (UNC). SOUTH CAROLINA. Aiken Co.: *Duke 1665* (UNC). Allendale Co.: *Radford & Radford 5341* (UNC). Anderson Co.: *Ahles & Radford 13473A* (UNC). Bamberg Co.: *Ahles & Haesloop 30508* (TENN, UNC). Barnwell Co.: *Ahles & Baird 56951* (UNC). Beaufort Co.: *Bell 3820* (UNC). Berkeley Co.: *Ahles & Haesloop 26659* (UNC). Calhoun Co.: *Ahles & Haesloop 30188* (UNC). Charleston Co.: *Gibbs* (NY). Chesterfield Co.: *Coker* (UNC). Clarendon Co.: *Radford 24607* (UNC). Colleton Co.: *Bell 4549* (UNC). Darlington Co.: *Smith 1345* (UNC). Dillon Co.: *Ahles & Haesloop 27725* (UNC). Dorchester Co.: *Ahles & Haesloop 26170* (UNC). Fairfield Co.: *Bell 9446* (UNC). Florence Co.: *Rodgers et al. 73448* (NLU). Georgetown Co.: *Godfrey & Tryon 135* (MO, NY, TENN). Hampton Co.: *Ahles & Bell 12434* (NY, UNC). Hoary Co.: *Coker* (UNC). Jasper Co.: *Leonard & Radford 1686* (ALA, MISS, NLU, TEX, UNC). Kershaw Co.: *Duke 1492* (UNC). Lexington Co.: *Radford 23266* (UNC). Malboro Co.: *Canby* (NY). Marion Co.: *Bell 13673* (UNC). Orangeburg Co.: *Ahles & Haesloop 25465* (UNC). Richland Co.: *Eggert* (MO). Sumter Co.: *Radford 27532* (GA).

2. POLYGALA GRANDIFLORA Walter var. ANGUSTIFOLIA T. & G., Fl. N. Amer. 1: 671. 1840. non *P. angustifolia* HBK (= *P. bryzoides* St.-Hil.).

TYPE: UNITED STATES. FLORIDA: *Dr. Leavenworth s.n.* (LECTOTYPE: NY !; SYNTYPE: "Middle Florida", *Dr. Chapman*, NY !).

P. flabellata Shuttlw. ex Gray, Pl. Wright 1: 41. 1852. pro syn.
TYPE: UNITED STATES. FLORIDA. Monroe Co.: "Ad oras sylvarum juxta mare, Ins. Key West, Feb 1846", *Rugel 37* (US !).

P. cubensis Chodat, Monog. Polyg. 2: 62, t. 15, f. 36. 1893.
TYPE: CUBA: *Wright 112*, pro parte (HOLOTYPE: Herb. Krug ex Urb.—B, possibly destroyed; ISOTYPES: GH !, BM !, US ! (mixed Coll.)).

P. grandiflora var. *leptophylla* Chodat, Monog. Polyg. 2: 57. 1893. non *P. leptophylla* Burch, 1822.
TYPE: CUBA: *Wright 112*, pro parte (HOLOTYPE: Herb. Krug ex Urb.—B, possibly destroyed; ISOTYPE: GH !; PARATYPES: DOMINICAN REPUBLIC. SIERRA DE PALO: Quemado, 500 m. 10 May 1887, *Eggers 1890* K !, BM, not found fide Caumm in litt.).

P. grandiflora var. *orbicularis* Chodat, Monog. Polyg. 2: 57. 1893.
TYPE: DOMINICAN REPUBLIC: "prope Santiago ad Cuesta de Piedra, solo calcareo in graminosis; Preneloup., n° 1004 in savannis p. S. Carlon generale". (not seen).

P. corallicola Small, Bull. N. Y. Bot. Gard. 3: 425. 1905.
TYPE: UNITED STATES. FLORIDA. Dade Co.: Miami, *J. K. Small & G. V. Nash s.n.* (LECTOTYPE: NY !).

P. ambigens Blake in Britton, Bull. Torrey Bot. Club 50: 40. 1923.
TYPE: CUBA. ORIENTE: Sabana del Cerro, near Cerro Pelado, between Zarzal y Nagua, Jul 1922 *Leon 10860* (HOLOTYPE: US !).

P. grandiflora var. *leiodes* Blake, N. Amer. Fl. 25(5): 339. 1924.
TYPE: UNITED STATES. FLORIDA. Lee Co.: pineland vicinity of Ft. Myers, 19 Mar 1916, *Miss J. P. Standley 25* (HOLOTYPE: US !; ISOTYPES: NY !, MO !).

P. miamiensis Small ex Blake, N. Amer. Fl. 25(5): 340. 1924.
TYPE: UNITED STATES. FLORIDA. Dade Co.: Everglades west of Miami, 1-9 Nov 1901, *J. K. Small & G. V. Nash 289* (HOLOTYPE: NY !).
Asemeia miamiensis (Small ex Blake) Small, Man. S. E. Fl. 767. 1933.
A. leiodes (Blake) Small, Man. S. E. Fl. 766. 1933.

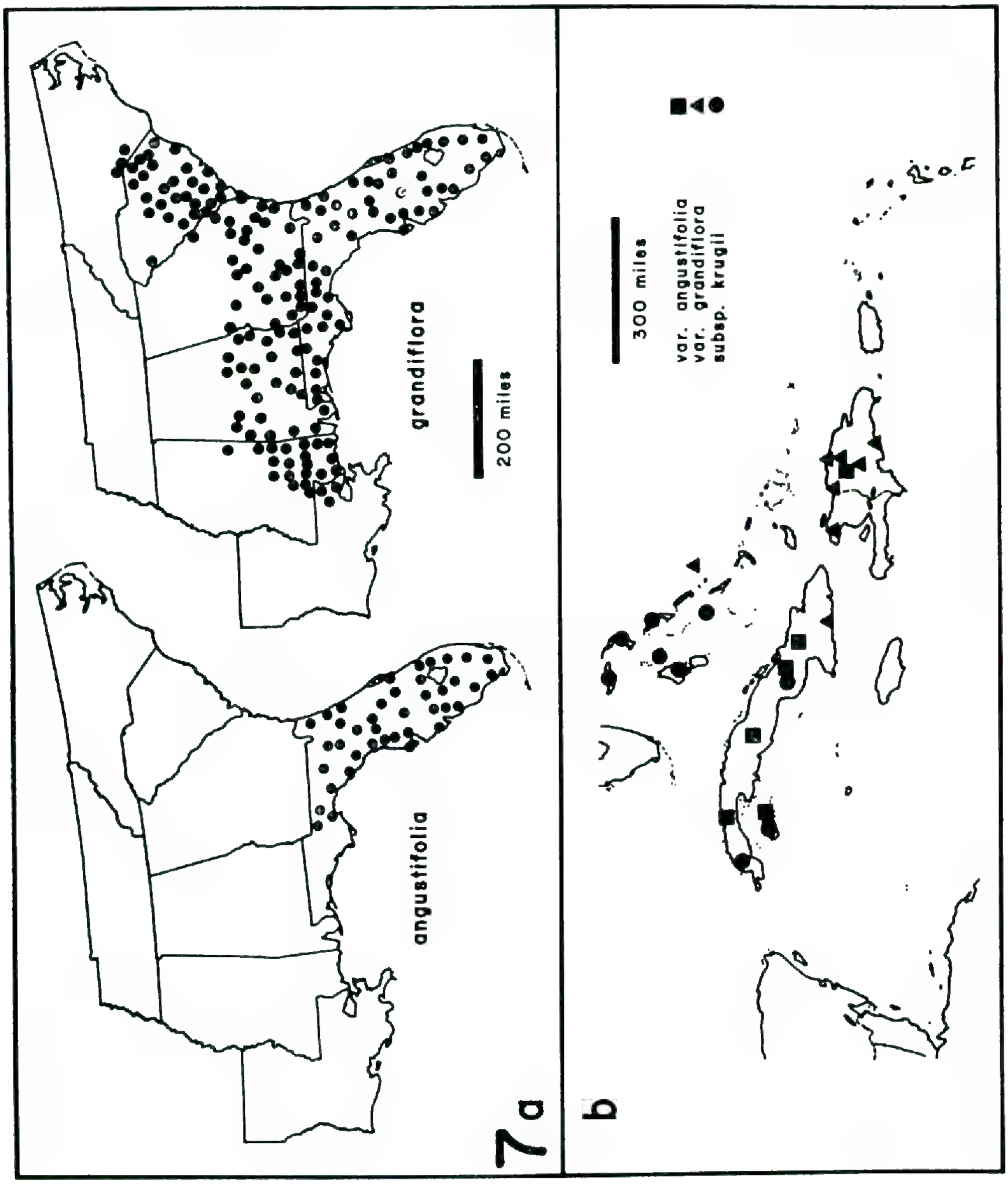

Figure 7. Distribution of the *Polygala grandiflora* complex. a. County distribution of the varieties of subsp. *grandiflora* in the southeastern United States; b. Distribution of *P. grandiflora* in the West Indies.

Stems erect to ascending, 1.3–10.0 dm tall, largely herbaceous, glabrous to tomentose with incurved, appressed trichomes (rarely with a few spreading or intermediate trichomes), occasionally with a blistered or pustulate surface. Leaves linear to linear-elliptic, glabrous to moderately pubescent with incurved trichomes, 30.7 (11.5–64.0) mm long, 2.2 (0.25–6.0) mm wide, 18.7 (2.0–46.0) times longer than wide. Upper sepals 2.1 (1.4–2.7) mm long with largely glandular trichomes. Wings 4.8 (3.0–6.0) mm long, 4.3 (2.5–5.0) mm wide, pale to deep purple, reticulated or not. Seeds 1.8 (1.3–2.2) mm long, 1.0 (0.5–1.2) mm wide, 2.1 (1.5–3.3) times longer than wide. (n = 14).

Anthesis: All year in the tropical and subtropical portions of its range, March to August in the more temperate regions.

Habitat and distribution: Dry, sandy habitats similar to those occupied by variety *grandiflora*, such as pinelands, roadsides, and open fields; distributed from Gadsden and Duval Counties, Florida south to the Florida Keys, Cuba, and the Dominican Republic (Fig. 7).

Additional specimens examined:

CUBA. CAMAGUEZ: *Ekman* (US). HABANA: *Ekman* (US). ISLE OF PINES: *Palmer & Riley 857* (US). ORIENTE: *Figueiras 1124* (US). SANTA CLARA: *Smith & Hodgdon 3089* (US). DOMINICAN REPUBLIC: *Eggers 1890* (K). UNITED STATES. FLORIDA. Alachua Co.: *Murril* (MO). Brevard Co.: *Moldenke 227* (DUKE, MO, NY). Broward Co.: *Austin 4330* (FAU). Charolette Co.: *Godfrey 65335* (FSU). Citrus Co.: *Kral & Kral 6642* (FSU, GA, USF). Collier Co.: *Nauman et al. 794* (FAU). Dade Co.: *Nauman et al. 834* (FAU). DeSoto Co.: *Fulton 17* (USF). Dixie Co.: *D'Arcy & Smith 1514* (LL). Duval Co.: *Curtiss 4752* (FSU). Flagler Co.: *Smith & Myint 452* (USF). Gadsden Co.: *Tracy 3542* (NY). Glades Co.: *Lewis 5680* (MO, TEX). Hendry Co.: *Eyles 6804* (DUKE, GA). Hernando Co.: *Kral & Kral 7017* (FSU, GA, USF). Highlands Co.: *Ray et al. 9730* (USF). Hillsborough Co.: *Lakela 30039* (NLU). Lake Co.: *Cooley & Eaton 7331* (USF). Lee Co.: *Eaton 1379* (LL, SMU). Leon Co.: *Wilson 267* (FSU). Levy Co.: *Sharp & Shanks 7054* (TENN). Marion Co.: *Mather M-257* (FSU). Martin Co.: *Nauman & Tatje 803* (FAU). Monroe Co.: *Killip 44437* (NY). Okeechobee Co.: *McCart 10757* (FAU, SMU). Orange Co.: *Richardson* (DUKE). Osceola Co.: *Schalert 4813* (SMU). Palm Beach Co.: *Nauman 1187* (FAU). Pasco Co.: *Ray et al 9904* (USF). Pinellas Co.: *Genelle & Fleming 687* (USF). Polk Co.: *Shank et al. 7187* (TENN). Putnam Co.: *Barnhart 1272* (NY). Saint Johns Co.: *Godfrey 70217* (FSU). Saint Lucie Co.: *Harris s.n.* (FAU). Sarasota Co.: *Henderson 63-1567* (FSU). Sumter Co.: *Genelle & Fleming 1830* (USF). Suwanee Co.: *Hitchcock* (MO). Taylor Co.: *Wiggins 20049* (UNC). Union Co.: *Beckwith 683* (US). Wakula Co.: *Henderson 70-01* (FAU).

3. POLYGALA GRANDIFLORA subsp. **krugii** (Chodat) Nauman, comb. et stat. nov.

P. kugii Chodat, Monog. Polyg. 2: 63, t. 15, f. 37-38. 1893.
TYPE: BAHAMAS. NEW PROVIDENCE: *Eggers 4450* (HOLOTYPE: Herb. Krug ex Urb.—B, destroyed; ISOTYPE: fragment NY !).

P. bahamensis Blake, Contrib. Gray Herb. 47: 64. 1916.
TYPE: BAHAMAS. NEW PROVIDENCE: pine region, 13.5 km (8.5 mi) S.W. of Nassau, 12 Apr 1903, *A. E. Wight 272* (HOLOTYPE: GH !; ISOTYPES: NY,

not found fide Schofield in litt., US, not found fide Bell in litt.; PARATYPE: BAHAMAS. ANDROS: Red Bays, 15 Apr 1890, *J. I. & A. R. Northrop 465* GH, K).

Stems largely erect, 1.6–6.3 dm tall, glabrous, incurved trichomes rarely found on younger portions, surface usually blistered or pustulate. Leaves linear to narrowly elliptic or oblanceolate, glabrous, 33.2 (14.0–49.0) mm long, 4.1 (1.3–6.0) mm wide, 10.4 (3.4–24.0) times longer than wide. Upper sepals 1.8 (1.3–2.2) mm long with largely non-glandular trichomes. Wings 3.5 (2.5–4.0) mm long, 3.1 (2.0–3.5) mm wide, deep purple, reticulated. Seeds 1.6 (1.4–1.9) mm long, 0.9 (0.7–1.0) mm wide, 1.9 (1.6–2.3) times longer than wide.

Anthesis: All year.

Habitat and distribution: These are plants of pinelands, savannas, and disturbed sites; distributed in the Bahama Islands and Cuba (Fig. 7b).

Additional specimens examined:
BAHAMAS. ABACO: *Correll & Popenoe 42618* (FTG, NY). ANDROS: *Correll et al. 49667* (FTG). GRAND BAHAMA: *Correll 50499* (FTG, NY). ELEUTHRA: *Krauss et al. 206* (FAU). EXUMA: *Correll & Sauleda 50414* (FTG NY). NEW PROVIDENCE: *Correll & Popenoe 40432* (FTG). CUBA. CAMAGUEZ: *Britton et al. 13179* (NY). ISLE OF PINES: *Curtiss* (NY). PINAR DEL RIO: *Britton et al. 6380* (NY).

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THE DISTRIBUTION OF *PILULARIA AMERICANA* A. BR. (MARSILEACEAE) IN NORTH AMERICA, NORTH OF MEXICO

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Pilularia americana A. Br., a member of the Marsileaceae, is an inconspicuous mat-forming aquatic fern with filiform leaves (2–6 cm long), creeping rootstocks, and globose sporocarps (2 mm in diameter) that are attached below the hydrosoil (Small, 1964) (figure 1). According to Christensen (1905), it is one of six species in the genus and is known only from scattered stations in the New World.

Pilularia was first collected in North America by Thomas Nuttall from Fort Smith on the Arkansas River during his famous botanical foray of 1818-20. It was reported in his list of collected species without indicating a specific epithet (Nuttall, 1837). In 1864, Alexander Braun described the species *Pilularia americana* from Nuttall's collection (Small, 1935). Small (1935) indicated that although specimens collected by Nuttall are scarce, there is a specimen of his Arkansas collection of *Pilularia* at the New York Botanical Garden.

Additional collections of *Pilularia* were not made until the late 1800's and these were from California (Santa Barbara County, 1879; San Diego County, 1884) and Oregon (Lake County, 1894). The 1894 Oregon collection was originally reported from Crook County, but is now in an area included in Lake County (K. L. Chambers, pers. comm.). In 1935, J. K. Small reported a specimen collected in 1901 by collectors of the Biltmore Herbarium from Barrow County, Georgia, that had escaped mention in the fern literature (Small, 1935).

This report spurred McVaugh to attempt to rediscover the Barrow County population. In this he was unsuccessful, however, he did find specimens growing with *Isoëtes* in pools on granite flat rocks in Walton County, Georgia (McVaugh, 1936), and in a muddy pond in Washington County, Georgia (McVaugh, 1943). LaMotte and a student accidentally collected sporocarps of *Pilularia* in 1934 from similar granitic habitats in central Texas (LaMotte, 1940). In the early 1940's, *Pilularia* was rediscovered in Arkansas and newly collected from Kansas. No further populations were known until the 1960's when it was reported from Oklahoma (Correll, 1967) and Nebraska (McGregor, 1967). This established the distribution of *Pilularia* in Arkansas, California, Oregon, Georgia, Texas, Kansas, Oklahoma, and Nebraska. Reports

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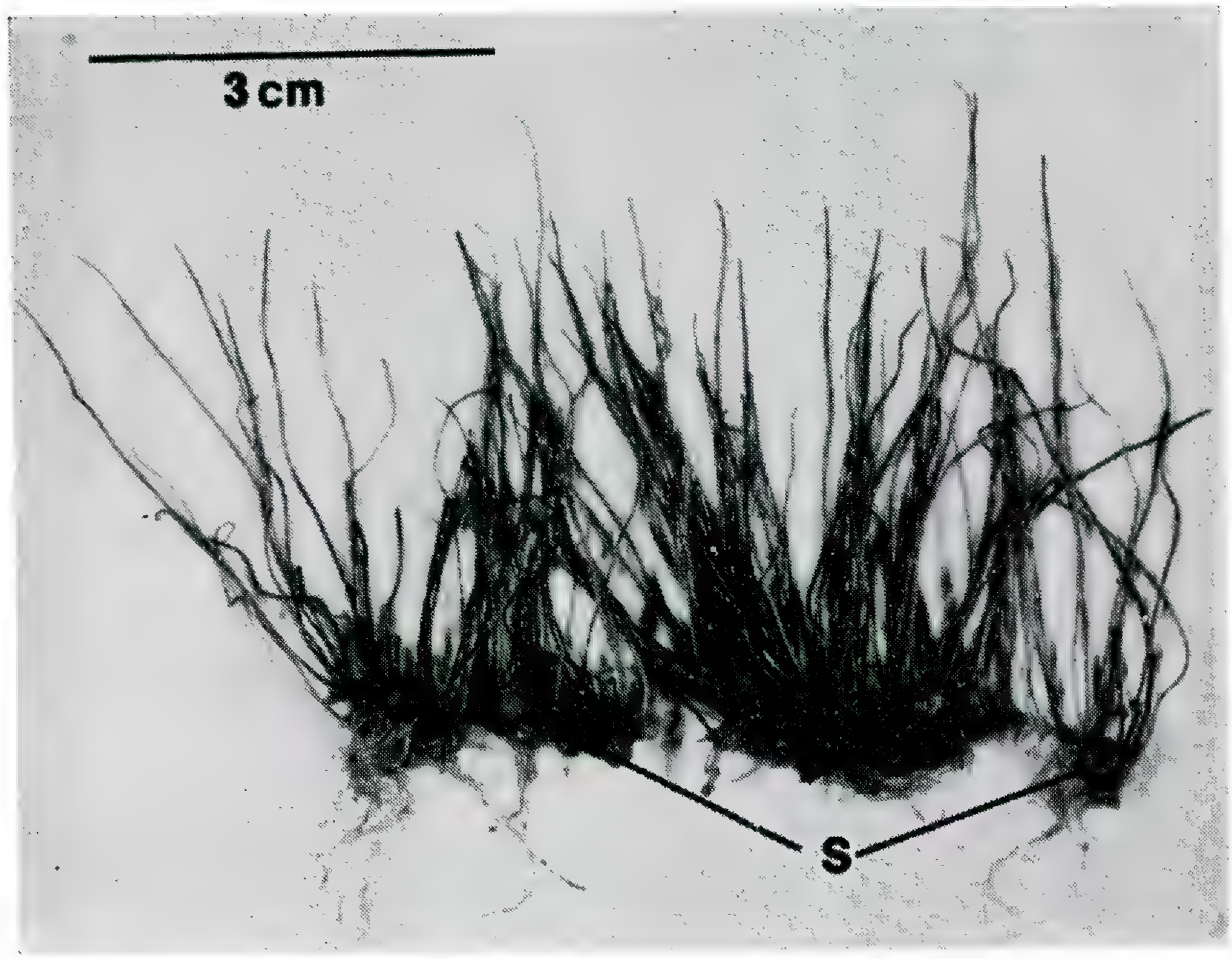

Figure 1. *Pilularia americana* with sporocarps (S).

of *Pilularia* from Louisiana (Correll, 1967) and Illinois (Mohlenbrock, 1975) were later found to be errors (Petrik-Ott and Ott, 1980; R. H. Mohlenbrock, pers. comm).

In June 1979, *Pulularia* was first collected in Tennessee from Dogwood Lake in Henderson County (*Webb, Dennis, & Price, 2001*, TENN, VDB). Later in August (*A. J. Petrik-Ott, 1379* & *F. D. Ott*, US) and September (*Dennis* & *Nakosteen, 2375*, TENN), independent collections were made from Fall Creek Falls Lake in Van Buren County, Tennessee. The Van Buren population was reported by Petrik-Ott and Ott (1980).

In an attempt to define the known distribution of *P. americana* in North America, north of Mexico, 44 herbaria were consulted as to their holdings of this species. Thirty-two herbaria responded (see acknowledgements) and based on these records *P. americana* is known from 55 counties in nine States (figure 2).

These records indicate that *P. americana* is far more common in California than any other part of its range. It occurs in vernal pools throughout the State and has been collected in 39 of the 101 years since it was first discovered there. It is most often collected in April and May, but has been

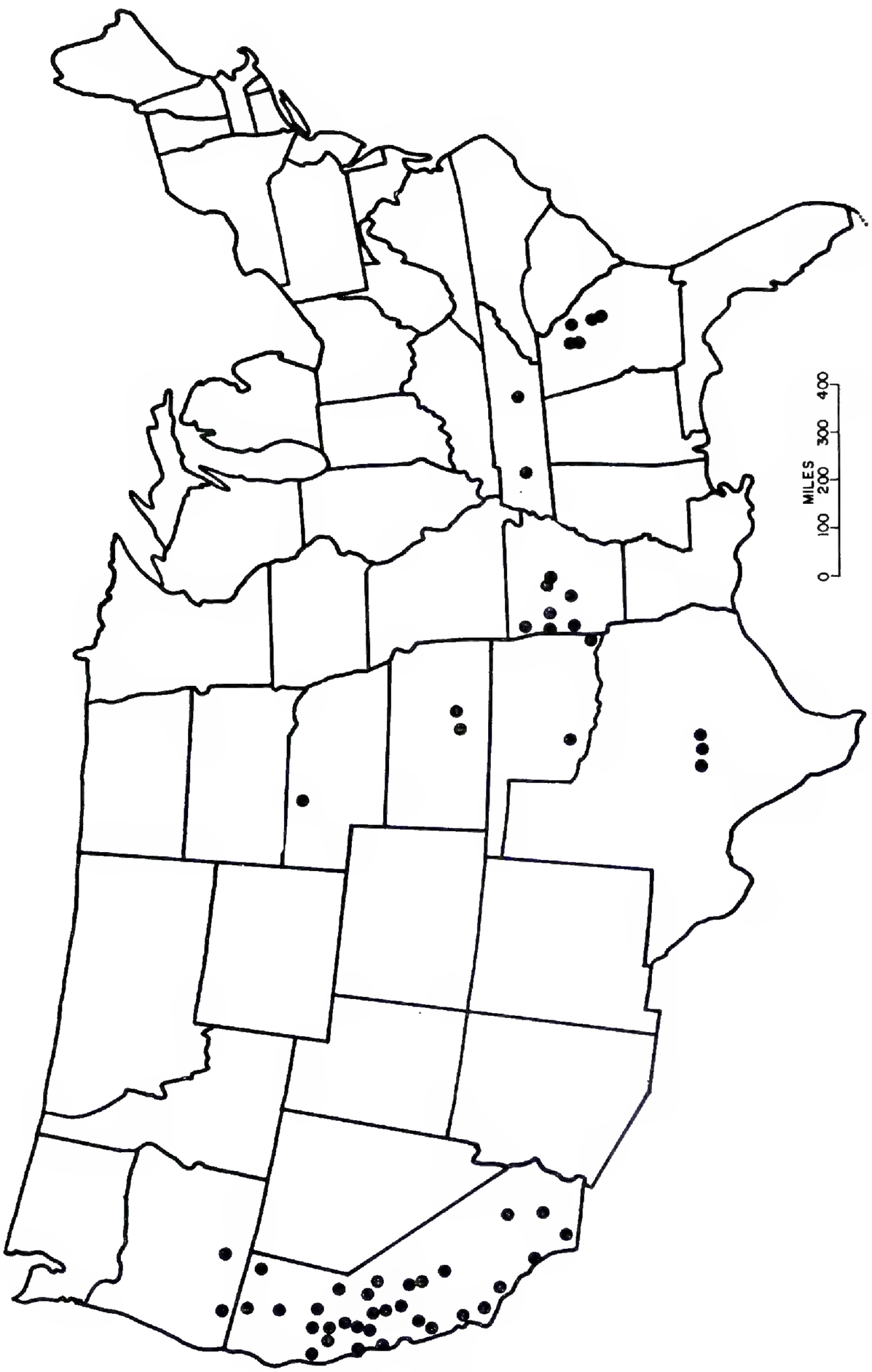

Figure 2. Distribution of *Pilularia americana.*

found as early as March and as late as September. The Oregon populations are in counties adjacent to California in similar habitats.

In Arkansas, *P. americana* is found along margins of lakes in the Ozark region and in Oklahoma it is known from only three lakes in two counties. The Kansas and Nebraska populations occur in natural ponds of sandhill regions that are subject to desiccation (R. E. Brooks, pers. comm.). With the exception of the Washington County population which occurs in the inner coastal plain, the Georgia populations are confined to shallow seasonal poo!s on granite outcrops in the piedmont province. In Texas, this species a!so is confined to seasonal pools in areas of granitic outcropping.

The newly discovered Tennessee populations are in artificial lakes of recent origin (late 1960's), both of which experience some drawdown or lowering of the water level in the fall. The lakes are, however, in quite dissimilar physiographic regions. The Henderson County population is in the Mississippi embayment region of west Tennessee whereas the Van Buren population occurs on the Cumberland Plateau.

McMillan *et al.* (1968) conducted studies to determine what factors contributed to the limited distribution of *P. americana* in Texas. Their findings indicated that the "special niche" of *Pilularia* in Texas and perhaps the eastern U.S. may be attributable to the following:

> (a) sporophytes that cannot withstand complete desiccation, (b) sporophytes that can withstand various levels of submergence, (c) sporocarp production stimulated by drying conditions, (d) sporocarp development under a range of photoperiod-temperature conditions, (e) sporophytes that are vegetatively inhibited by calcareous soils and vegetatively stimulated by granitic soils with pH of 5.2 to 6.5, (f) rapid germination of spores when exposed to moisture, (g) germination of spores over a range of temperatures and media, (h) inhibition of germination in submerged calcareous soils of pH 7.5–8.1.

It appears from habitat data from throughout the range of *P. americana* that the main requirement for this species is a semipermanent aquatic habitat. Historically, this type habitat has been limited to "natural" sites such as vernal pools, ponds subject to desiccation, and seasonally wet depressions on rock outcrops. More recently, however, with the multitude of manmade impoundments, most of which are designed for seasonal drawdown, habitat is being created for colonization.

McMillian *et al.* (1968) found *Pilularia* in newly created habitats such as quarries in the same vicinity of natural habitats in Texas. The Tennessee populations, however, indicate that *Pilularia* has the ability to colonize new habitats in areas much removed (>170 miles) from known populations. Dissemination to these areas is presumed to be attributable to waterfowl as has been previously suggested by McMillian *et al.* (1968). Also noteworthy at these Tennessee stations is the degree to which this species has become established. In 1979 the Henderson County population formed dense stands in the drawdown zone of Dogwood Lake and appeared to be outcompeting

Eleocharis acicularis. Although sterile, sporophytes of *Pilularia* from Dogwood Lake have been collected at depths of up to four feet during mid-summer prior to fall drawdown. In September 1979, when the lake at Fall Creek Falls State Park was four to six feet below maximum pool, *Pilularia* formed a monotypic stand from the normal water line to a depth of several feet for the entire length of shoreline that could have been seen from the dam.

The studies of McMillian *et al.* (1968) indicate that *P. americana* is restricted to slightly acidic semipermanent aquatic habitats. The recent discoveries of this species in Tennessee in artifically created habitats much removed from known populations suggest that it may be disseminated for some distance presumably by waterfowl and become successfully established. Due to its inconspicuous habit which could easily be confused with mats of *E. acicularis*, additional populations of *Pilularia* have probably been overlooked. The ability of *Pilularia* to rapidly and extensively colonize drawdown zones should make it a candidate species for management efforts on these often barren niches. Studies of this nature are underway.

ACKNOWLEDGEMENTS

The authors wish to express appreciation to Albert H. Price III for preparation of the figures and to the curators of the following herbaria for providing distributional data: ASTC, BAYLU, BH, BKL, CPH, DAV, DS, DUKE, FLAS, FSU, GA, GEO, GH, ISC, KANU. LA, LRU, MICH, NCU, NEB, OKLA, ORE, OSC, SACT, SFSU, SMU, TENN, TEX, UARK, UC, VDB, WTU.

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PLANTS NEW TO ARKANSAS, OKLAHOMA AND TEXAS

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ABSTRACT

The following taxa are reported new to ARKANSAS: *Hypoxis longii*; OKLAHOMA: *Aristida roemeriana, Eragrostis refracta, Gymnopogon brevifolius, Panicum hirticaule, Paspalum langei, Paspalum notatum, Carex albursina, Carex careyana, Carex hitchcockiana, Hymenocallis caroliniana, Fatoua villosa, Chenopodium glaucum, Mirabilis gigantea, Ranunculus sardous, Camelina sativa, Cardamine hirsuta, Alchemilla microcarpa, Rubus cuneifolius, Melilotus indica, Hibiscus moscheutos, Samolus cuneatus, Lithospermum multiflorum*; and from TEXAS: *Hypoxis longii* and *Rudbeckia triloba. Isoetes butleri*, type location in Oklahoma, has been recollected for the first time in over 100 years from that state.

The following taxa, except *Isoetes butleri*, are thought to be newly reported to the Arkansas, Oklahoma, or Texas floras. All specimens cited are deposited at the Southeastern Oklahoma State University Herbarium (DUR) unless otherwise indicated. Duplicates of most of these species will be distributed in our regular exchange program.

We express our gratitude to Dr. Bill Mahler and Barney Lipscomb of the Southern Methodist University Herbarium for their assistance with our work at the herbarium. Also to Dr. R. Dale Thomas for help pertinent to *Fatoua villosa*. Some of the field work was supported by U.S. Department of the Interior, Water and Power Resources Service under Contract Number 9-07-50-X0426 and Fish and Wildlife Service Contract Number 14-16-0002-19-215.

ISOETES BUTLERI Engel. OKLAHOMA. Choctaw Co.: 0.5 mi SW of Ft. Towson, 19 Apr 1980, *J. & C. Taylor 28743*; Johnston Co.: on limestone at Blue River Public Hunting Area, about 8.4 mi NE of Tishomingo, 19 Jun 1980, *J. Taylor 29298*; McCurtain Co.: shallow pools on limestone, 6.7 mi N of the Red River along OK 98, SE of Valliant, 15 Apr 1980, *J. & C. Taylor 28688*. The type location for this species is Limestone Gap in Atoka County, Oklahoma. It was collected by Mr. Butler from Indian Territory over 100 years ago (Engelmann, 1878). This one specimen had remained the only documentation of this species occurrence in Oklahoma despite numerous efforts to relocate it. In the Spring of 1980, while investigating *Leavenworthia aurea*, a local Oklahoma and Texas endemic, this species was finally recollected from several limestone areas.

ARISTIDA ROEMERIANA Scheele. OKLAHOMA. Love Co.: limestone hill,

about 8 mi W of Marietta, 16 May 1978, *J. Taylor 26049.*

ERAGROSTIS REFRACTA (Muhl.) Scribn. OKLAHOMA. McCurtain Co.: pine forest around pond at Bokhoma Recreational area in the Ouachita National Forest, SE of Idabel, 13 Sep 1974, *J. & C. Taylor 16946.*

GYMNOPOGON BREVIFOLIUS Trin. OKLAHOMA. Pushmataha Co.: hillside bog, 3.5 mi SE of Antlers along OK 3 & 7, 19 Oct 1979, *J. & C. Taylor 28493.*

PANICUM HIRTICAULE Presl. OKLAHOMA. Cimarron Co.: along Cimarron River, 5 mi N of Kenton, sandy soil, 25 Sep 1976, *J. Taylor 23724C.*

PASPALUM LANGEI (Fourn.) Nash. OKLAHOMA. Marshall Co.: sandy beach and disturbed habitat adjacent to Lake Texoma, 2 mi E and 1.25 mi S of Enos, 6 Jun 1980, *J. & C. Taylor 29051*; McCurtain Co.: below dam of Barney Ward Lake, 1.5 mi W and 1.5 mi S of Tom, 11 Sep 1979, *J. Taylor 28178.*

PASPALUM NOTATUM Flugge. OKLAHOMA. Bryan Co.: sand dune area of Red River, 3 mi S of Albany, 30 Jun 1972, *J. & C. Taylor 10931*; McCurtain Co.: Loblolly pine forest, 3 mi SE of Haworth, burned over area in Spring of 1971, 22 Jul 1972, *J. & C. Taylor 11147*; Pushmataha Co.: from area adjacent to bog, about 6 mi W and 2.9 mi S of Antlers, 22 Oct 1975, *J. Taylor 20942.* An introduced cultivated pasture grass, this species has established itself in southeastern Oklahoma.

CAREX ALBURSINA Sheldon. OKLAHOMA. Leflore Co.: mesic north-facing slope on Rich Mountain about 150 yds W of the Okla-Ark state line, near OK 1, 30 Aug 1979, *J. Taylor 28123.*

CAREX CAREYANA Dewey. OKLAHOMA. Leflore Co.: mesic north-facing slope on Rich Mountain about 150 yds W of the Okla-Ark state line, near OK 1, 30 Aug 1979, *J. Taylor 28127*, and north slope of Rich Mountain, 5.5 mi NE of Big Cedar, 3 Jul 1980, *J. Taylor 29386*, and 31 May 1980, *J. Taylor 28981.*

CAREX HITCHCOCKIANA Dewey. OKLAHOMA. Leflore Co.: mesic north-facing slope on Rich Mountain about 150 yds W of the Okla-Ark state line, near OK 1, 30 Aug 1979, *J. Taylor 28122.*

HYMENOCALLIS CAROLINIANA (L.) Herb. OKLAHOMA. Choctaw Co.: sandy pasture about 0.5 NE of US 70 bridge over Boggy River, 7 Aug 1979, *J. & C. Taylor 27924* and in bar ditch along US 70, 0.5 mi W of Choctaw-McCurtain Co. line, 22 Jul 1972, *J. & C. Taylor 11156*; McCurtain Co.: Beavers Bend State Park, transplanted and grown as a house plant in authors' home for 3 years before it bloomed in the summer of 1979; low lying area along Little River, 5.5 mi S of Broken Bow, 29 Aug 1976, *J. Taylor 23286*; and Glover River, creek bottom in rocky area, 22 Jul 1972, *K. Williams s.n.*; Pushmataha Co.: grassland about 4.6 mi E of Antlers along OK 3 & 7, 30 Jul 1979, *J. Taylor 27842.*

HYPOXIS LONGII Fern. ARKANSAS. Clark Co.: edge of woods along roadside of Ark 8, 3 mi W of its jct with I-30, 26 Aug 1979, *J. & C. Taylor*

28082; Columbia Co.: Natural pine-hardwood forest along US 82, 0.6 mi W of its jct with Ark 98, just E of Waldo, frequent, 25 Aug 1979, *J. & C. Taylor 28020*; Lafayette Co.: pine woods along both sides of road, 1.6 mi W of Lewisville, 25 Aug 1979, *J. & C. Taylor 28018*; Miller Co.: 0.6 mi W on Ark 160 from its jct with 237, then 0.2 mi E on dirt road in a traffic triangle, only 2 plants, 25 Aug 1979, *J. & C. Taylor 28012* and along Ark 134, 0.2 mi E of its jct with US 71, about 2 mi S of Fouke, abundant, 25 Aug 1979, *J. & C. Taylor 28016*; Sevier Co.: 6.5 mi N of DeQueen along US 71, 29 Apr 1980, *J. Taylor 28850*. TEXAS. Bowie Co.: along Tex 8 about 3 mi W and 2.8 mi N of Maud, infrequent, 25 Aug 1979, *J. & C. Taylor 28004*; Cass Co.: rest stop 3.2 mi E of Douglasville along US 77, 25 Aug 1979, *J. & C. Taylor 28009*. This species, originally considered for the National Endangered Species List and thought to be perhaps extinct, was rediscovered in Oklahoma (Taylor & Taylor, 1977). Recent investigations (Taylor and Taylor, 1980) indicate it is perhaps a very widespread but unrecognized constituent of the understory of Loblolly pine forests.

FATOUA VILLOSA (Tunb.) Nakai. OKLAHOMA. McCurtain Co.: woods, 1.6 mi N of Philadelphia Cemetery in Goodwater Community, 13 mi NE of Idabel, Sec 15, T7S, R26E, 24 Mar 1979, *Clifford Citty, s.n.* (NLU, DUR).

CHENOPODIUM GLAUCUM L. OKLAHOMA. Cleveland Co.: along South Canadian River SW of Norman near site of old 2 lane highway bridge, 6 Jul 1976. *J. Taylor 22895*.

MIRABILIS GIGANTEA (Stand.) Shinners. OKLAHOMA. Greer Co.: in campground along stream below the dam in Quartz Mountain State Park, 9 Jul 1976, *J. Taylor 22507*.

RANUNCULUS SARDOUS Crantz. OKLAHOMA. Atoka Co.: McGee Creek Project Area in pasture, west side of Potapo Creek, 12 mi E and 1 mi N of Atoka, NW 1/4, Sec 11, T2S, R13E, 24 May 1979, *J. Taylor 27496*; McCurtain Co.: bottomland along McKinney Creek east of Tom along OK 3, common, 4 Jun 1976, *J. & C. Taylor 21580*.

CAMELINA SATIVA (L.) Crantz. OKLAHOMA. Caddo Co.: low shale-caped mounds, 6.5 mi W, 0.75 mi S of Hinton, 11 May 1973, *J. & C. Taylor 13052*; Grady Co.: field near Chickasha, 18 Apr 1937, *G. Mitchell s.n.* (OKL); Grant Co.: 20 mi W of Medford, roadside, loose sandy soil, common, 30 Apr 1974, *S. Stevens 74821* (OKL); Lincoln Co.: 10 mi N of Shawnee on OK 18 at Pottawatomie-Lincoln Co. line, 14 Apr 1969, *K. & M. Crook* and *J. Massey 863* (OKL); Pottawatomie Co.: 8 mi W of Shawnee Lake Road and 100 yds S on OK 102, 21 Apr 1973, *J. Heer 81*.

CARDAMINE HIRSUTA L. OKLAHOMA. Choctaw Co.: Raymond Gary Lake Park, east side of reservoir on limestone about 1.9 mi SE of Ft. Towson, 30 Mar 1980, *J. & C. Taylor 28612*; Leflore Co.: south end of Poteau City Park in Poteau, 24 Mar 1979, *R. M. West 3*; and in yard 702 E. Creek Ave, Heavener, *C. Howze* and *J. Olive 64*; McCurtain Co.: near west end of Broken Bow Dam on Mt. Fork River, 24 Apr 1971, *J. & C. Taylor 7640*;

and limestone bluff at Goodwater area, 15.5 mi NE of Idabel, 7 Apr 1978, *J. Taylor 25798B.*

ALCHEMILLA MICROCARPA Boiss & Ruet. OKLAHOMA. McCurtain Co.: edge of road about 100 yds W of Cerro Gordo, 3 May 1980, *J. Taylor 28896.*

RUBUS CUNEIFOLIUS Pursh. OKLAHOMA. Leflore Co.: mesic forest, north slope of Rich Mountain about 7 mi E of jct of OK 1 and US 259, 25 Sep 1979, *J. Taylor 28247.*

MELILOTUS INDICA (L.) All. OKLAHOMA. Bryan Co.: 0.75 mi E of Cobb in pasture on south side of road, 24 Apr 1976, *D. Ellis 84*; Choctaw Co.: 2 mi E and 2 mi S of Hugo, sandy well drained roadside ditch, 10 May 1969, *J. Askew 92*, and 2 mi E, 1 mi S of Hugo, open field, 10 May 1969, *J. Askew 93*. Love Co.: 16 mi West of Marietta, sandy roadside OK 32, 13 May 1976, *J. & C. Taylor 21089.*

HIBISCUS MOSCHEUTOS L. OKLAHOMA. McCurtain Co.: collected along Waterfall Creek, 8 mi S and 2 mi E of Idabel near US 259, 11 Sep 1979, *J. Taylor 28164.*

SAMOLUS CUNEATUS Small. OKLAHOMA. Bryan Co.: sand dunes of Red River, 3 mi S of Albany, 30 Jun 1972, *J. & C. Taylor 10932*; along Lake Oberlin, 1 mi S of Oberlin, 27 Jul 1963, *J. & C. Taylor 1961* (OKL); blind lake, 3 mi S and 2 mi E of Albany, 11 Jun 1964, *J. & C. Taylor 2227* (OKL), spring-fed stream in flats below Denison Dam on Red River, 8 Jul 1959, *W. T. Penfound s.n.* (OKL); Cleveland Co.: north side of South Canadian River, SW of Norman near site of old 2 lane bridge, 6 Jul 1976, *J. Taylor 22883*; Jackson Co.: gypsum area along Red River, 4 mi S and 4 mi E of Eldorado, 10 Jul 1976, *J. Taylor 22633.*

LITHOSPERMUM MULTIFLORUM Torr. ex Gray OKLAHOMA. Cimarron Co.: edge of Lake Carl Etling, NW of Boise City, moist disturbed habitat, 31 May 1967, *J. & C. Taylor 3816*; Jackson Co.: gypsum area along Red River, 4 mi S and 4 mi E of Eldorado. 10 Jul 1976, *J. Taylor 22636.*

RUDBECKIA TRILOBIA L. TEXAS. Lamar Co.: roadside near creek bottom, 4 mi W of Paris, 30 May 1972, *J. & C. Taylor 10605.*

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A NEW SPECIES AND NEW COMBINATION OF MEXICAN *ERIGERON* (COMPOSITAE)

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ABSTRACT

A new species, *Erigeron tephropodus Nesom*, is recognized from Oaxaca. *Erigeron lepidopodus* (Robinson and Fernald) Nesom is transferred from *Aster* to a more natural position. Description and illustrations are given for both.

Recent studies of Mexican *Erigeron* have revealed the existence in Oaxaca of a new species, described below. Another species, from Chihuahua and Durango, is transferred to *Erigeron* from *Aster*. A full description is given of the latter because of its unique morphology and the limited description given in the original publication.

ERIGERON **tephropodus** Nesom, sp. nov. (Fig. 1).

Flosculorum radiatorum numerosorum ligula angusta circinata necnon phyllariis inter se aequilongis *E. longipedi* DC. et *E. scaposo* DC. ut videtur affinis, sed stolonibus foliatis elongatis, foliis caulinis haud amplexicaulibus, pube caulium foliorumque paginae inferioris albovillosa, necnon pappi setis 8-12 tenuissimis diversa.

Perennial herbs from short caudices with fibrous roots, producing 1–2 erect stems and 1-several leafy, decumbent stolons. Erect stems 10–15 cm tall, simple or with 1–2 short branches on the lower half, often purplish, white-villous; stolons up to 35 cm long, densely villous near the tips, less so below. Leaves white-villous below, moderately appressed-pubescent above, eciliate, basal 20–87 mm long, blades 4–20 mm wide, elliptic-obovate, with 2–4 pairs of shallow, mucronulate serrations on the upper half, long-attenuate to petiolar region 1/8–1/3 as long as leaf, cauline mostly on lower half of erect stem, gradually reduced in size upward, toothed, becoming sessile, the uppermost entire, linear-oblanceolate, 8–14 mm long, leaves of stolons relatively even-sized, 15–25 mm long, short-petiolate. Heads terminal on peduncles 2.0–7.5 cm long and at stolon tips; involucres hemispheric, 7–9 mm wide (pressed); phyllaries in 2–4 equal to subequal series, narrowly elliptic-oblanceolate with acuminate apices, 3.5–5.0 mm long, 0.3–0.6 mm wide, light green, outer sparsely spreading-pubescent, densely and minutely stipitate-glandular, margins and tips often purplish, scarious on the inner, midregions greenish-brown; receptacles not observed. Ray flowers ca 120–180 in 2–4 series, corollas white, drying white, 6.0–7.5 mm long, ligules 0.4–0.6 mm wide, 3–4 veined, enrolling with maturity. Disc flowers funnelform, not inflated or indurated, 2.8–3.2 mm long; style branches 0.5–0.6

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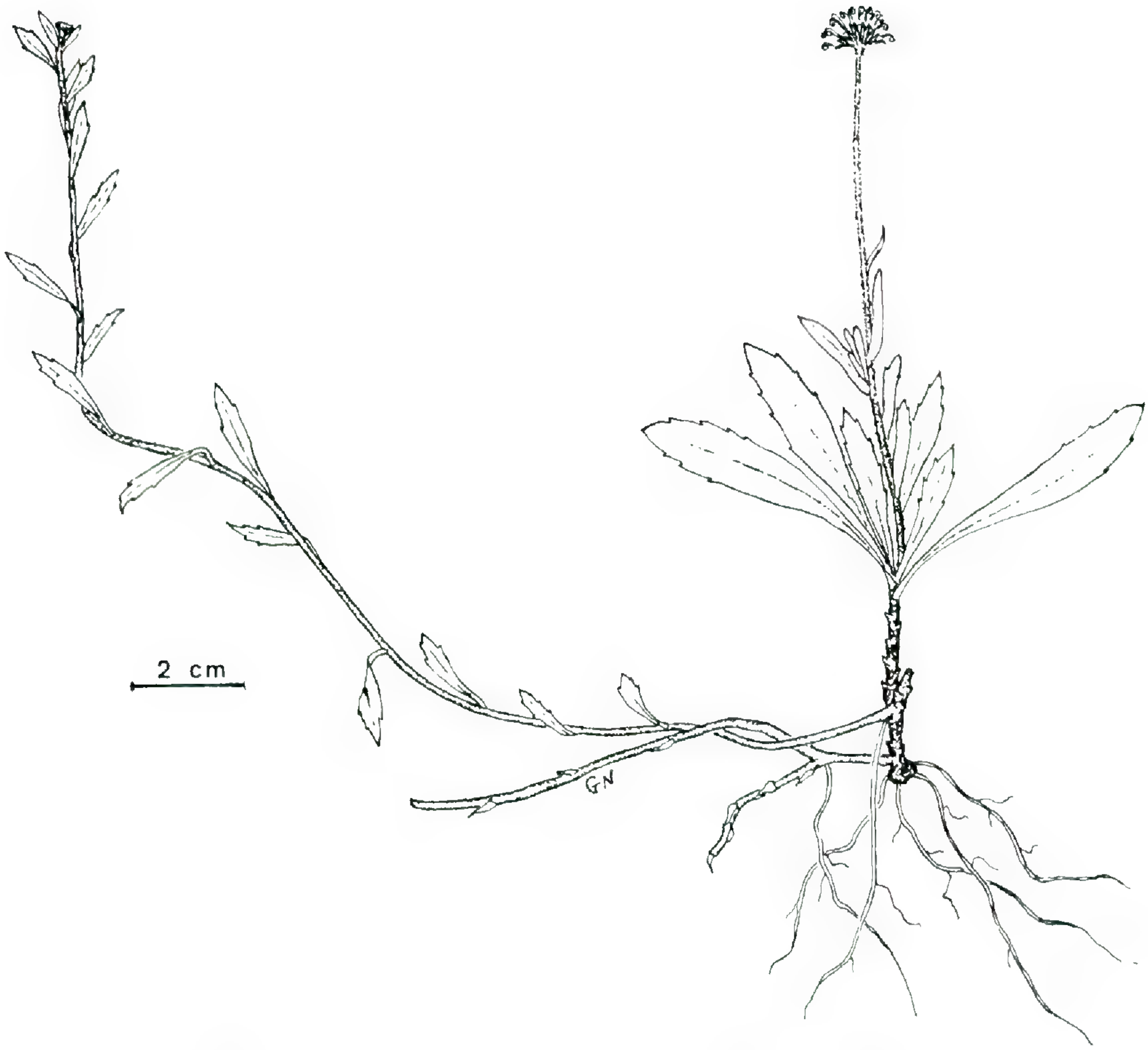

Figure 1. Habit sketch of *Erigeron tephropodus* Nesom (Holotype).

mm long, including the shallowly triangular to widely deltate collecting appendages 0.1–0.2 mm long. Achenes strigose, radially compressed, 2-ribbed, mature size not observed; carpopodium 3–5 cells high; pappus of ray and disc achenes similar, of 8–12 very fragile bristles 3/4–5/6 the disc corolla height, with an outer series of setae less than 0.1 mm high.

TYPE: MÉXICO. OAXACA: 8 km SW of Tlaxiaco, oak forest with scattered pines, steep, rocky ravines, shallow soil over limestone outcrops, abundant on banks near stream, 1900 m, 7 Feb 1965, *R. McVaugh 22299* (HOLOTYPE: MICH!; ISOTYPE: CAS!, ENCB!).

Additional collections examined: GUERRERO: Cacahuamilpa, 15 Jan 1956, *Paray 1882* (ENCB). MORELOS: Alrededores de Alta Palmira, Mcpio. de Temixco, 1300 m, 4 Mar 1968, *Flores Crespo 278* (ENCB).

Erigeron tephrodopus is widely divergent from any possible known relatives. The large number of ray flowers with very narrow, curling ligules and the phyllaries of equal to subequal length are distinctive characters which it shares with members of the *E. longipes* DC.-*E. scaposus* DC. alliance. How-

ever, from these it differs significantly in its non-clasping cauline leaves and white, densely villous pubescence on the erect stems and lower leaf surfaces. Achenes of *Erigeron tephropodus* have only 8–12 pappus bristles, compared to the 18–24 typically found on achenes of *E. longipes-E. scaposus*, and the long, herbaceous, leafy stolons bearing terminal capitula in *E. tephropodus* contrast with the slender rhizomes in *E. longipes-E. scaposus*, which are subterranean, scale-leaved, and rapidly become woody.

ERIGERON **lepidopodus** (Robinson and Fernald) Nesom, comb. nov. (Fig. 2)

Aster lepidopodus Robinson and Fernald, Proc. Amer. Acad. A. & S. 30: 117. 1894. TYPE: MÉXICO. CHIHUAHUA: Pine forests about Chuchuichupa, 14 Jun 1891, *C. V. Hartman 697* (HOLOTYPE: US!; ISOTYPE: US!).

Perennial herbs from fibrous roots; erect stems produced from long (3–15 cm), slender, decumbent, rhizomiform branches with scale leaves. Erect stems 6–28 cm tall, simple or with 1 (2–3) short branches on upper half, often purple near the base, sparsely to moderately spreading- to deflexed-spreading-pubescent with trichomes 0.5–1.1 mm long, sparsely to moderately minutely stipitate-glandular at least in the peduncle region. Leaves shiny-textured above, markedly lighter in color below, sparsely spreading-pubescent to glabrous or glabrate, margins strongly ciliate near the base or in lower half, basal in a rosette at the stem-rhizome juncture or sometimes completely absent, 10–18 mm long, blades 3–7 mm wide, obovate, entire, attenuate to petiolar region 1/8–1/10 as long as leaf, apex apiculate to mucronulate, cauline mostly linear, 6–26 mm long, 0.6–2.1 mm wide, entire, sessile, ascending, even-sized but abruptly reduced to 1–2 linear bracts below the heads, scale leaves triangular, 3–12 mm long, 1.5–3.2 mm wide at bases, stramineous and thin with 3–5 parallel veins, glabrous or with short-ciliate margins, sometimes directly transitional to cauline leaves (when basal absent). Heads terminal on peduncles 2.5–10.0 cm long; involucres hemispheric, 12–20 mm wide (pressed); phyllaries in 3–5 imbricated to unequal series, reflexing after release of achenes, narrowly triangular to narrowly oblanceolate, inner 8.0–9.5 mm long, 0.8–1.5 mm wide, stramineous with a dark brown midregion and scarious margins, outermost 1/2–2/3 as long as inner, glabrate to moderately spreading-pubescent and densely to very sparsely stipitate-glandular; receptacles very shallowly convex, conspicuously foveolate. Ray flowers 14–34 in a single series, corollas drying white to light purple, sometimes with a lilac midstripe, 10.0–14.0 mm long, ligules 1.4–2.4 mm wide, 4–8 veined, not curling or reflexing, conspicuously pubescent near the tube with biseriate trichomes, often with abundant uniseriate trichomes. Disc flowers tubular to narrowly funnelform, not inflated or indurated, 4.8–5.9 mm long; style branches 1.1–1.3 mm long, including the triangular to narrowly triangular or lanceolate collecting appendages 0.4–0.6 mm long. Achenes narrowly oblong, slightly compressed radially, 3.5–4.5

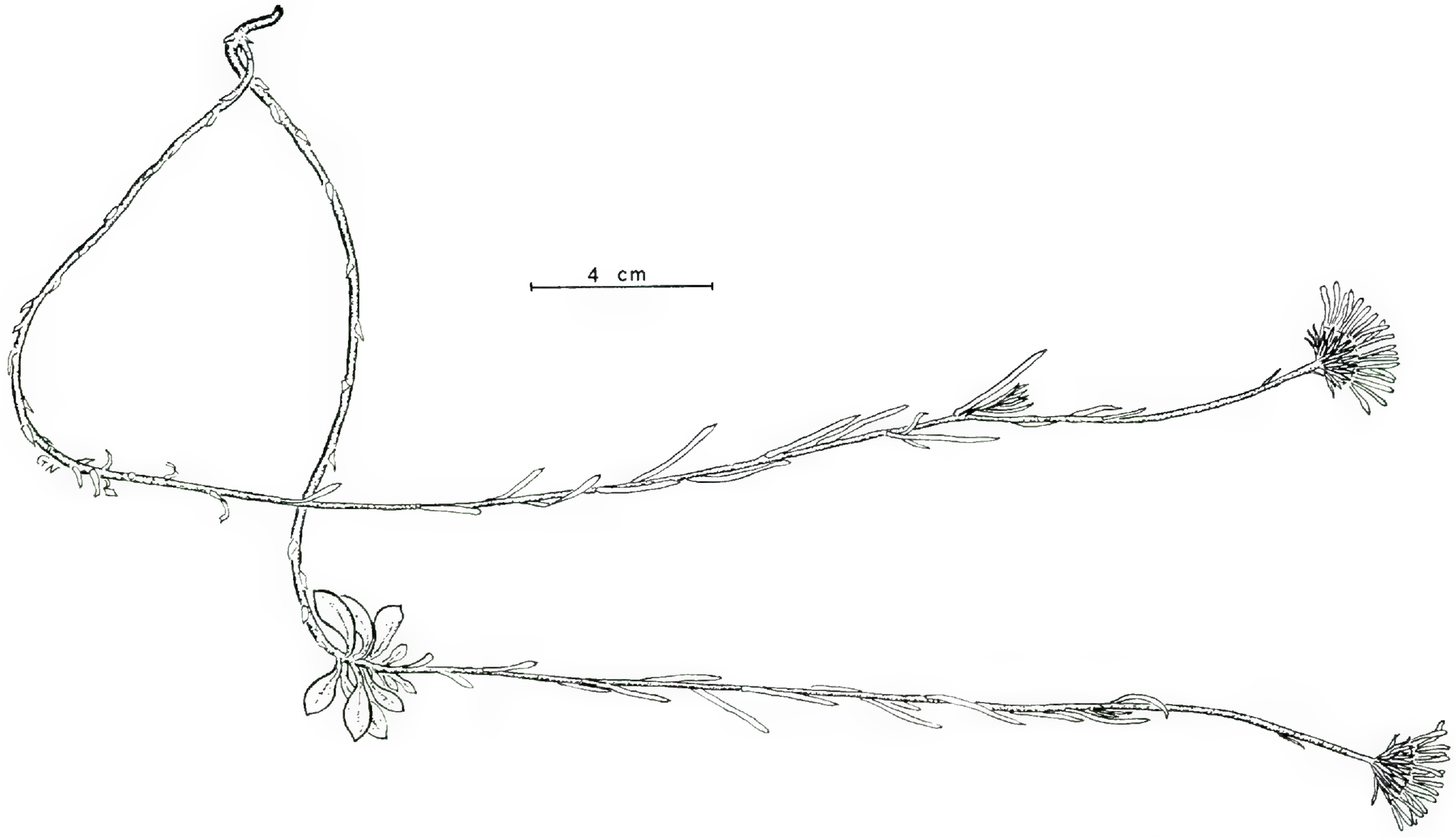

Figure 2. Habit sketch of *Erigeron lepidopodus* (Robinson and Fernald) Nesom (*Palmer 190*, UC).

mm long, 0.7–0.9 mm wide, with 2 or 4 thick, light-colored ribs, densely strigose to sericeous; carpopodium 8–14 cells high; pappus of ray and disc achenes similar, of 34–50 persistent bristles of unequal length, the longest nearly equalling the disc corolla height, with a few outer setae or bristles 0.4–0.8 mm high.

Additional collections examined: CHIHUAHUA: aquatic plants covering 50% of the water surface in water holes along arroyo and at base of rock outcrops, in pine-oak forest SE of Creel, 2400 m (ca 7200 ft), Mcpio. de Bocoyna, 9 May 1973, *Bye 3687* (COLO, MEXU); Mojarachic, 9 Apr 1940, *Knobloch 7055* (US); vicinity of Madera, ca 2250 m, 27 May-3 Jun 1898, *Palmer 286* (CM, MO, US); near Colonia Garcia, 2500 m (7500 ft), 7 Jun 1899, *Townsend and Barber 12* (MO, NY, US); Durango, San Ramón, 21 Apr-18 May 1906, *Palmer 190* (CM, MO, NY, UC, US).

Although few qualitative characters can be used without exception to distinguish *Aster* from *Erigeron*, the narrow, non-herbaceous phyllaries of *E. lepidopodus* are out of place in *Aster* but characteristic of *Erigeron.* Ligules which remain straight rather than curling with maturity and a double pappus also are more commonly found in *Erigeron.* Also, while the lanceolate collecting appendages of the disc flower style branches such as in *E. lepidopodus* are more typical of those found in *Aster*, they occur as well in other species of *Erigeron.*

The more appropriate generic placement of this species was also recognized earlier by E. L. Greene. He apparently intended to make the new combination, because the plants collected by Townsend and Barber were distributed with printed labels reading "Erigeron lepidopodus Greene", but this name was never formally validated by publication.

In addition to the unusual, scale-leaved, rootless, rhizomiform branches of *Erigeron lepidopodus*, other distinctive characters are the reduced branching of the erect stems, linear, ascending cauline leaves, relatively small number of ray flowers, strongly unequal to imbricated phyllaries, lanceolate collecting appendages of the style branches, and densely strigose to sericeous, narrowly oblong achenes with a relatively large number of pappus bristles. The achenes are not columnar, as originally described by Robinson and Fernald; as is typical in *Erigeron*, they are radially compressed, though not strongly.

The affinities of *Erigeron lepidopodus* with the genus are not clear.

ACKNOWLEDGEMENTS

I thank curators of the following herbaria, from which specimens were studied: CAS, COLO, CM, ENCB, MEXU, MICH, MO, NY, UC, and US. I also appreciate a discussion with Almut Jones regarding the generic placement of *Erigeron lepidopodus*. Rupert Barneby reviewed and made salutary changes in the Latin diagnosis.

TAXONOMIC RELATIONSHIPS OF TEXAS SPECIMENS OF *DIGITARIA CILIARIS* AND *DIGITARIA BICORNIS* (POACEAE)[1]

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ABSTRACT

Numerical techniques were used to clarify the taxonomic relationships between two closely related grasses, *Digitaria ciliaris* and *Digitaria bicornis*. Principal component analysis illustrated distinct specimen clusters, whereas a correlation phenogram showed a distinct dissimilarity between the species and high degree of similarity among populations within the species. A multiple discriminant analysis procedure showed that there were no misclassifications of the specimens. *Digitaria bicornis* was found to have a shorter distance to the first lateral nerve on the lemma of the lower floret, a longer second glume, and a shorter first glume. Minor characters included a shorter main axis and a longer average rachis length. The length of the second glume, main axis, and rachis were characters previously not considered as taxonomically important. A nested analysis of variance showed these characters to have more than 70 percent of the measured morphological variation due to differences between species.

Digitaria ciliaris (Retzius) Koeler, southern crabgrass, is distributed in the temperate and tropical regions of both hemispheres and is a common weed throughout Texas. Retzius in 1786 originally described this species as a *Panicum* on the basis of type material from China and Java. Koeler transferred the taxon to *Digitaria* in 1802. Parlatore (1848) reduced the entity to varietal status under *Digitaria sanguinalis* (L.) Scopoli and the American authors, Fernald (1950) and Chase (1951), followed Parlatore in his treatment. Fernald stated that *D. sanguinalis* var. *ciliaris* (Retz.) Parl. had a longer and more pubescent spikelet than the typical variety. Chase (1951) differentiated this taxon from the typical variety on the basis of setaceous hairs (1.5 mm long), on the marginal nerves of the lemma of the lower floret. However, authors of current treatments of *D. ciliaris* (reported as *Digitaria adscendens* (H.B.K.) Henrard by Ebinger 1962, 1965, Gould 1963, Correll and Johnston 1970, and Cronquist et al. 1970) do not rely on the latter character. Henrard (1950) chose to recognize only *Digitaria adscendens* because at the time of his monograph of the genus the type of *D. ciliaris* could not be located. After examination of the types, Blake (1969) concluded that *D. adscendens* was a latter synonym of *D. ciliaris*. Evidence for the validity of *D. ciliaris* at the species level was given by Ebinger (1962)

[1] This is a Technical Bulletin No. T.A. 16462, Texas Agricultural Experiment Station.

SIDA 9(1): 34–42. 1981.

and Gould (1963) who both used the name *D. adscendens*. Ebinger (1962) found *D. ciliaris* to possess a longer spikelet and a longer second glume than did *D. sanguinalis*. In addition, *D. sanguinalis* was found to possess spicules on the lemma of the lower floret and pappilose based hairs at the base of the leaf whereas *D. ciliaris* did not. Gould (1963) found *D. ciliaris* to be hexaploid ($2n = 54$) and *D. sanguinalis* to be tetraploid ($2n = 36$). However, Mehra & Sharma (1973) reported a chromosome number of $2n = 36$ for Himalayan specimens of *D. ciliaris*. Ebinger (1962) and Gould (1963) provided morphological and cytological evidence that indicated that *D. sanguinalis* and *D. ciliaris* do hybridize, however the degree of introgression presently is unknown.

Digitaria bicornis (Lamarck) Roemer & Schults was described in 1791 on the basis of type material from India. This species is distributed throughout the tropical and subtropical regions of both hemispheres. In Texas, *D. bicornis* is restricted to sandy loam areas in the eastern portion of the state. A later synonym, *Digitaria diversiflora* Swallen, was published in 1963 based on type material from Jamaica. Swallen noted that this type was originally identified as *D. adscendens* (= *D. ciliaris*) by A. S. Hitchcock. Swallen (1963) differentiated his species from *D. ciliaris* by stating that it had heteromorphic spikelets (which refers to the sessiled spikelet being glabrous and the pedicellate spikelet being densely pubescent), a shorter first glume, and equidistant nerves on the lemma of the lower floret. Vegetatively, *D. bicornis* is similar to and thereby often confused with both *D. sanguinalis* and *D. ciliaris*. The range of morphological variation of this species is presently poorly understood. Gould (1966) reported the chromosome number of *D. bicornis* (= *D. diversiflora*) to be $2n = 72$, an octoploid.

The objective of the present study was to evaluate the morphological relationships existing between populations of *D. ciliaris* and *D. bicornis*.

METHODS

Seventeen *D. ciliaris* populations and 12 *D. bicornis* populations were sampled *Webster* 1698-1729, TAES). One hundred and six specimens of *D. bicornis* and 166 specimens of *D. ciliaris* were collected. Thirteen characters on each specimen were measured. Previously the equidistant nervation of the lemma of the lower floret (DLN) and the length of the first glume (LFG) have been the primary characters used to separate the taxa. In the present study, the DLN and LFG were measured to the nearest 0.01 mm. The DLN was recorded by measuring the distance from the center of the midnerve to the center of the first lateral nerve. Swallen (1963) and Gould (1975) stated that the pedicellate spikelet of *D. bicornis* had densely villous margins. However, spikelet pubescence was not measured as it appears that this character is to some extend dependent on spikelet maturity. Younger spikelets may appear essentially glabrous whereas older spikelets

may be densely villous. Average rachis length (ARL), length of main axis (LMA), length of the bract sheath (LBS), length of the bract blade (LBB), and width of the bract blade (WBB) were measured to the nearest millimeter. Characters measured to the nearest 0.1 mm included the pedicel length (PL), length of the second glume (LSG), and spikelet length (SL). Rachis width (RW) and spikelet with (SW) were measured to the nearest 0.01 mm. Finally, the number of spikelets per three centimeters of rachis (NS) was recorded. Measurements of the spikelets and rachis were taken from material located in the central portion of the primary branches. Data were analyzed using the Statistical Analysis System (Barr et al., 1977) and the Numerical Taxonomy System of Multivariate Statistical Programs (NT-SYS) package (Rohlf et al., 1971).

RESULTS AND DISCUSSION

Populations of *D. ciliaris* and *D. bicornis* frequently grow intermingled so that when the specimens for this study were collected they were artificially separated into separate populations. To take advantage of this a priori separation of the taxa a multiple discriminant analysis (canonical variate analysis) procedure was initially performed on the specimens. This procedure showed that there were no misclassifications and was evidence for the distinctness of the taxa. Principal component analysis (PCA) and a correlation phenogram were calculated on the data using the NT-SYS package. These procedures were especially useful in evaluating variation within *D. ciliaris* and *D. bicornis* since they do not require an a priori classification of the specimens. In PCA the data were standardized by rows and a variable by variable correlation matrix was calculated. The greatest positive correlation coefficients were between ARL and LBS ($r = .839$), LFG and DLN ($r = .713$), ARL and SGL ($r = .700$), DLN and LMA ($r = .662$), LFG and LMA ($r = .657$), and ALR and LBB ($r = .635$). Important negative correlation coefficients existed between SGL and LFG ($r = -.598$), ARL and LFG ($r = -.545$), and PL and LFG ($r = -.527$). Principal components were extracted from the matrix and used in plotting the specimens. Information concerning the composition and percent variation of the first six factors is given in Table 1. Factor 1 accounts for 37.3% of the variation, whereas Factor 2 accounts for 22.3%. Thus, Figure 1 represents nearly 60% of the measured morphological variation. Important characters contributing to the variation accounted for by Factor 1 included ARL, SGL, LFG, LBS, and NS. Characters mainly responsible for the variation accounted for by Factor 2 (vertical axis) included WBB, LMA, LBB, DLN, and LBS. Figure 1 shows two distinct specimen clusters. Specimens which are referrable to the nomenclatural type of *D. ciliaris* are marked with circles, whereas those which are referrable to the nomenclatural type of *D. bicornis* are indicated by triangles. Specimens of *D. ciliaris* are separated from those of *D. bicornis* based on a combination of the previously mentioned characters. Figure 1 indicates

TABLE 1

Composition, percent variation, and cumulative percent of the first six components in the principal component analysis.

Component	Variables with intracomponent correlation greater than ±.500	% Variation	Cumulative %
1	ARL, LBS, RW, PL, SGL, LFG, LMA, DLN, NS	37.28	37.28
2	LBS, LBB, WBB, SL, SW, LMA, DLN	22.30	59.58
3	SL, SW	9.42	69.00
4	None	6.27	75.26
5	None	4.54	79.80
6	None	4.01	83.81

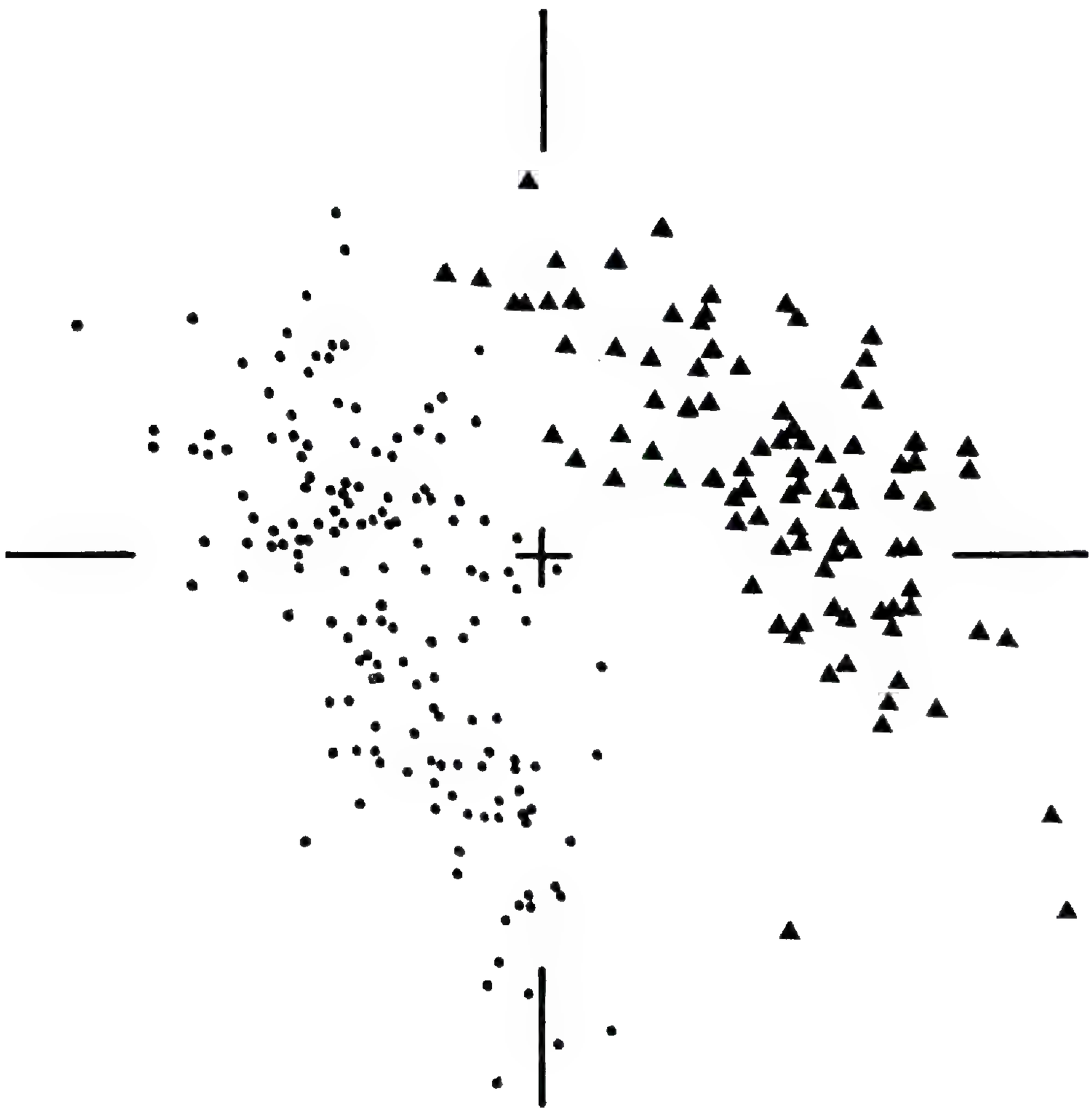

Figure 1. Specimens of *D. ciliaris* (circles) and *D. bicornis* (triangles) clustered by means of first (horizontal) and second (vertical) principal components.

a close morphological relationship between the taxa but enforces their distinction. The phenetic relationship of the species at the population level is illustrated by the correlation phenogram in Figure 2. The phenogram was calculated using population means for all 13 characters, with each character contributing equal weight. A high degree of dissimilarity exists between the species whereas populations within the species show a relatively high degree of similarity.

The means, ranges, standard deviations, and coefficients of variation of 13 characters for both species are given in Table 2. F-values and significance levels are then reported. Although range overlaps exist for all characters, the two species are significantly different for ten characters. Correll and Johnston (1970) and Gould (1975) used the presence or absence of equidistant nerves of the lemma of the lower floret as the primary character to separate *D. ciliaris* from *D. bicornis.* As indicated in Table 2, lengths of the first and second glumes are more reliable characters. The distance between the nerves of the lemma of the lower floret is the third most reliable character. No significance exists in spikelet width, therefore the distance from the center of the midnerve to the center of the first lateral nerve was considered a direct measurement of the nerve spacing. The presence of bristles on the marginal nerves of the lemma of the lower floret is frequently used to distinguish *D. bicornis* from *D. ciliaris.* However, Texas specimens of *D. bicornis* do not possess bristles. An interesting difference between these taxa is *D. bicornis* has paired heteromorphic spikelets, whereas *D. ciliaris* has paired homomorphic spikelets. The sessile spikelet of *D. bicornis* has a glabrous lemma of the lower floret, whereas the lemma of the lower floret of the pedicellate spikelet is densely pubescent on the margins. The taxonomic importance of this characteristic is limited because it is expressed only in the matured spikelet pair. Young spikelet pairs frequently appear homomorphic.

The minimum length of the second glume of *D. ciliaris* is 1.2 mm. This measurement appears to be within range for *D. sanguinalis* (Ebinger, 1962). Three plants possessing the short second glume were collected in an otherwise typical *D. ciliaris* population in extreme northeast Texas. However, these plants lacked conspicuous spicules on the nerves of the lemma of the lower floret, which are characteristic of *D. sanguinalis.* Morphologically these plants are intermediate between *D. ciliaris* and *D. sanguinalis* and might suggest hybridization between these taxa. Evidence for hybridization between these taxa was given by Ebinger (1962, 1965) and Gould (1963). Gould found that morphologically intermediate specimens had a chromosome number $2n = 48$ with multivalents consistently present during prophase and metaphase of Div. I in pollen mother cells. Ebinger showed that morphological intermediate specimens were not uncommon. Based on the frequent occurrence of intermediate specimens, it is suggested that hybridization is common in areas of sympatry. No evidence of hybridization was

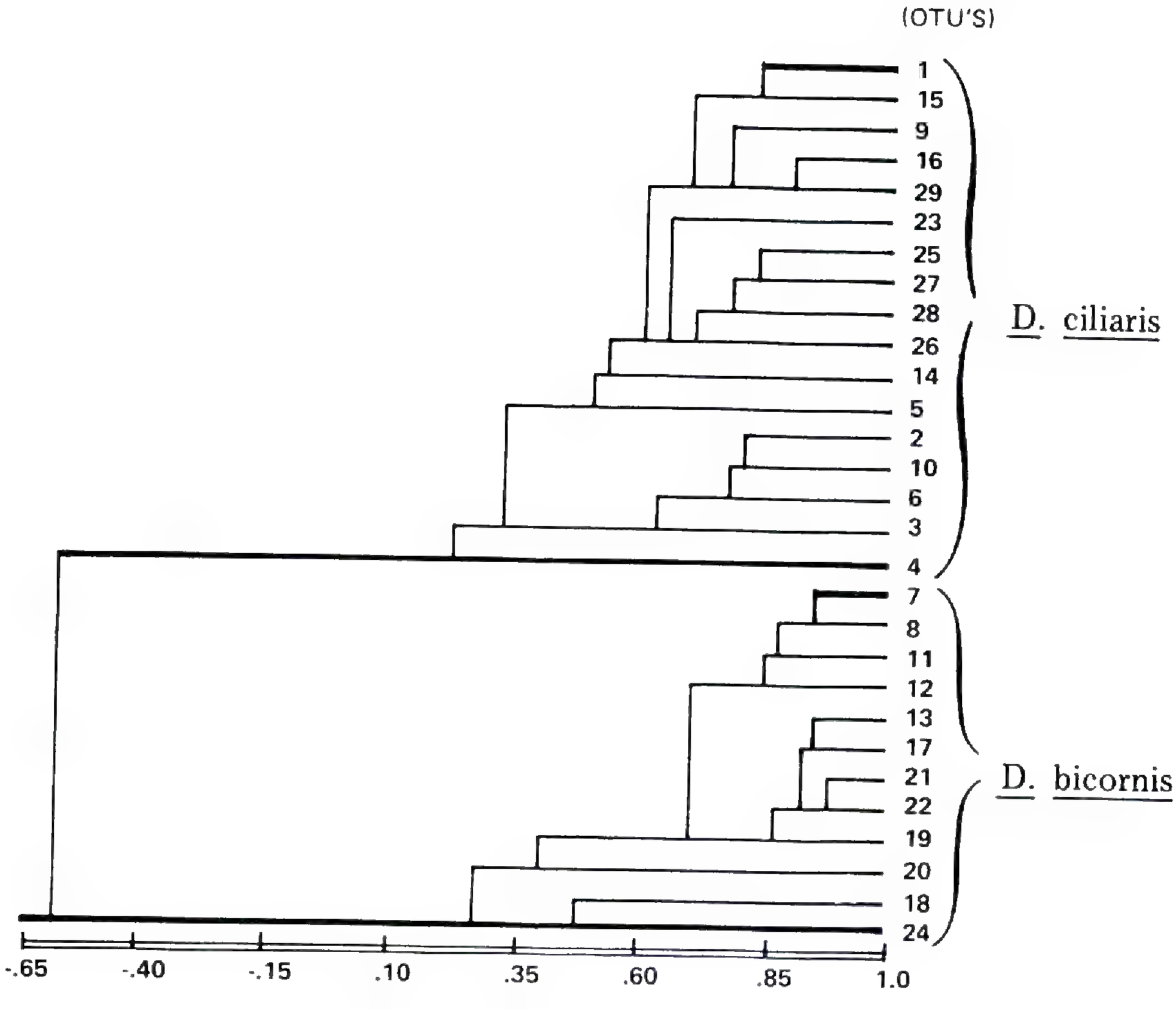

Figure 2. A correlation phenogram of 29 populations (OTU's) of *Digitaria ciliaris* and *Digitaria bicornis*.

found by this or previous investigations between *D. ciliaris* and *D. bicornis* even though populations frequently grow intermingled. Individual plants of these species grow in close association with each other which accounts for both species frequently occurring on the same herbarium sheet. Gould (1975) reported *D. sanguinalis* as a common weed in eastern Texas. Attempts to collect populations that could be morphologically referred to this species proved fruitless. Therefore, it is suggested that distinct populations of *D. sanguinalis* are rare or are possible nonexistent in this region.

Two highly significant characters not previously used to separate *D. ciliaris* from *D. bicornis* are rachis length and length of the main axis. Correll and Johnston (1970) noted that the inflorescence branches of *D. bicornis* (= *D. diversiflora*) are 3–10 (–16) cm long and the main axis to be 1–15 (–45) mm long. These same measurements are given for *D. ciliaris*. However, the

TABLE 2

Means, ranges, standard deviations, coefficients of variation, and F-values for 13 characters of *Digitaria ciliaris* and *Digitaria bicornis*. Distances given in millimeters.

	Digitaria ciliaris N= 166				Digitaria bicornis N= 106				
	$\bar{x}$	Range	s	C.V.	$\bar{x}$	Range	s	C.V.	F-value
ARL	90.06	51-148	19.77	21.9	131.56	74-183	25.91	19.7	222.9**
LBS	108.47	58-184	24.48	22.6	129.16	68-175	24.65	19.1	46.0**
LBB	59.33	12-130	25.05	42.2	65.14	21-195	23.99	36.8	3.6
WBB	4.10	2-8	1.28	31.1	3.97	2-8	0.99	24.9	0.7
RW	0.68	.47-.97	0.10	14.5	0.78	.52-.99	0.10	13.1	62.7**
PL	2.24	1.2-3.3	0.42	18.8	2.82	1.6-3.7	0.34	12.2	140.6**
LSG	1.80	1.2-2.3	0.22	12.2	2.43	1.9-2.9	0.21	8.8	539.1**
SL	3.29	2.7-3.7	0.17	5.3	3.37	2.6-3.7	0.19	5.8	11.6*
SW	0.85	.68-.99	0.07	7.9	0.86	.65-.99	0.07	8.1	2.8
LFG	0.38	.20-.56	0.07	18.5	0.18	0.3-.32	0.05	27.2	636.7**
LMA	11.56	0-36	6.02	52.1	0.91	0-31	4.39	484.7	247.7**
DLN	0.26	.20-.33	0.03	11.1	0.19	.14-.23	0.02	11.9	468.4**
NS	15.31	8-29	3.95	19.9	11.20	7-19	2.68	23.9	129.3**

* $<$ .001
** $<$ .0001

data presented in this study disagrees with these measurements. *Digitaria bicornis* has significantly longer lateral branches and seldom has a main axis. In plants possessing a main axis, the lateral branches were in 2 (–3) whorls. This is not the typical arrangement in *D. ciliaris*, which usually has a main axis and lateral branches that are not whorled. Correll and Johnston (1970) reported the rachis width and spikelet length of *D. bicornis* to be 1.0–2.0 mm and 2.5–3.1 mm, respectively. As Table 2 indicates, these measurements do not represent the true range of the species. *Digitaria bicornis* has a rachis width that does not exceed 1 mm and a spikelet length of 2.6–3.7 mm. Other characters where the taxa differ significantly include the pedicel length, length of the bract sheath, and number of spikelets per three centimeters of rachis length. Relatively low F-values and a high degree of range overlap make these characters statistically significant but of limited taxonomic usefulness. The number of nerves on the lemma of the lower floret was reported by Correll and Johnston (1970) as five, and Henrard (1950) as five. This study confirmed the presence of seven nerves on this lemma. The lemma of the lower floret of *D. ciliaris* typically has five nerves.

A nested analysis of variance was calculated on the data to show the percent variation due to differences between species, among populations, and among individual specimens within populations. Characters with 70% or more varation due to differences between species included the length of the second glume, length of the first glume, and distance of the first lateral nerve on the lemma of the lower floret. Average rachis length and length of the main axis were characters with more than 60% of the variation due to differences between species. Correspondingly, these are the five characters possessing the highest F-values. The eight remaining characters had 60% or more variation due to differences among populations and plants within populations.

Based on the information presented by this study it is evident that on a regional basis, *D. ciliaris* and *D. bicornis* are significantly morphologically distinct to be recognized as separate taxa. However, the full range of morphological and cytological variation from throughout the ranges of *D. sanguinalis, D. ciliaris,* and *D. bicornis* is presently unknown. Future biosystematics research is planned to accurately determine relationships in this complex.

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SUPPLEMENT TO FLORA OF THE TEXAS COASTAL BEND BY F. B. JONES

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During the years 1977–1979 I was employed by two large cattle companies in the Texas Coastal Bend region at sites not visited by Jones while preparing his *Flora* (Jones, per. communication). The ranches were managed primarily by F. B. Rooke and Sons of Woodsboro, Texas, and the M. E. O'Connor Trust of Victoria, Texas. The area studied includes large tracts of land on the coastal prairie and caliche hills in Victoria, Goliad, Refugio, and San Patricio Counties mostly between the Guadalupe River in the east and the Aransas River in the west, and north to Hwy. 59 in Goliad. This includes much of the eastern portion of Jones' *Flora of the Texas Coastal Bend.* It should be noted that the records from Victoria County extended the range covered by Jones. Using this work (Jones, 1977) and the *Manual of the Vascular Plants of Texas* (Correll & Johnston, 1970) as basic references, I have compiled a list of corrections, additions, and field observations to supplement Jones' *Flora.* The order followed in this paper correlates precisely with that of Jones' work and is page referenced to most easily annotate and supplement that publication.

I have included in this paper several non-indigenous species that have either escaped from cultivation into the native vegetation or have remained persistant at old house sites so that these would not be a mystery to the curious beginner. These plants were intentionally omitted by Jones.

Voucher specimens, cited by my personal collection numbers, have been deposited in several large herbaria indicated by acronyms in parentheses following *Index Herbariorum* (Holmgren & Keuken, 1974). In addition, collections are maintained by the O'Connor Trust at the Greta Ranch in Refugio, Texas (cited as 'oc') and at the McNamara Ranch in Goliad, Texas (cited as 'gol'), and by F. B. Rooke & Sons at Woodsboro, Texas (cited as 'r'). A few specimens are maintained in a research collection by P. A. Fryxell of Texas A&M University, College Station, Texas (cited as 'pf'). A more easily accessible set of specimens has been donated by the O'Connor Trust to Victoria College, Victoria, Texas (cited as 'vic') and is maintained in their library for study.

I would like to give special thanks to Fred Jones for his helpful comments on the manuscript. This is Scientific Article no. A-2838, Contribution no. 5889 of the Maryland Agricultural Experiment Station, Department of Botany.

SYSTEMATIC LISTING

POLYPODIACEAE (p. 1)

POLYPODIUM POLYPODIOIDES (L.) Watt. var. MICHAUXIANUM Weath. Epiphytic fern on live oak branches, shaded woodlands near creeks in Refugio and Goliad Counties. *6125* (gol, MARY, oc, TAES, vic, VT); *8126* (r).
THELYPTERIS KUNTHII (Desv.) Morton. Terrestrial fern on shaded creek banks, Woodsboro, Refugio County. *7316* (gol, MARY, oc, r, vic).

TYPHACEAE (p. 2–3)

TYPHA ANGUSTIFOLIA L. Easily confused with *T. latifolia* and *T. domingensis*, the male and female spikes are separated and the leaves are 5–8 mm wide and dark green. Refugio County. *7562* (oc, r).

POTAMOGETONACEAE (p. 3)

POTAMOGETON PUSILLUS L. Often confused with *P. pectinatus*, but the stipules are free from the leaf. Refugio County in ponds. *5684* (gol, oc, vic); *6008* (MARY, NO, VT).

NAJADACEAE (p. 4)

Correction: NAJAS, genus omitted in text.

CYPERACEAE (p. 6–18)

CAREX MUHLENBERGII Schkuhr. Similar to *C. cephalophora*, but bears bracts 1–3 (–20) cm long. Widespread. *4770* (oc, vic); *8241* (gol, MARY).
CYPERUS IRIA L. Weedy plant especially frequent in grain fields, found along ranch road in Goliad, Goliad County. *6461* (gol, MARY, oc, vic).
CYPERUS SESQUIFLORUS (Torr.) Mattf. & Kukenth. Sedge with a single thimble-shaped head, scarce along Melon Creek at the Greta Ranch, Refugio County. *5420* (oc, vic).
CYPERUS STRIGOSUS L. River bottoms, Refugio County. *5354* (oc); *5642* (vic); *7357* (r); *8483* (gol, r).
FIMBRISTYLIS ANNUA (All.) R. & S. Sandy roadside in Goliad County. *6322* (gol, oc, vic).
FIMBRISTYLIS VAHLII (Lam.) Link. Frequent in drying pond and creek beds, Refugio County. *6197* (MARY, oc, vic); *6380* (oc); *7226* (r, VT).
SCIRPUS KOILOLEPIS (Steud.) Kl. A dwarf sedge of moist sandy soil, widespread. *4774* (gol); *4865* (BM, oc, vic). Corrections: *Eleocharis acutisquamata* Buckl. (p. 13) is not in alphabetical order; the author of *Hemicarpha micrantha* is (Vahl) Britt.

ARACEAE (a new family to insert on p. 19)

ARISAEMA DRACONTIUM (L.) Schott. A scarce plant of shaded Coleto Creek bottomland, Victoria County. *8368* (gol, MARY, NY, oc, TAES, vic, VT).

LEMNACEAE (p. 19–20)

LEMMA TRINERVIS (Aust.) Small. Sometimes included in *L. minor* L., but the thallus is 3-nerved. Floating in pools along San Antonio River, Goliad County. *4854* (gol, MARY, oc, vic); *6267* (oc, vic).

PONTEDERIACEAE (p. 24)

PONTEDERIA CORDATA L. var. LANCEOLATA (Nutt.) Griseb. Occasional in marshes on open prairie, Greta Ranch, Refugio County. *5418* (gol, oc, vic).

LILIACEAE (p. 26–27)

NOLINA TEXANA Wats. A coarse grass-like plant of caliche hills along Hwy. 59, Goliad Co. *5742* (gol, oc, vic); *6489* (oc, vic); *8246* (gol, MARY, NY, VT).

Corrections: *Allium* (p. 28), *Nothoscordum* (p. 31) and Yucca (p. 27) are traditionally placed in this family rather than the Agavaceae or Amaryllidaceae. *Smilax tamnoides* L. var. *hispida* (Muhl.) Fern. is often treated as *Smilax hispida* Muhl. (p. 27).

AMARYLLIDACEAE (p. 28–31)

Correction: the author of *Allium elmendorfii* is M. Ownbey; *A. runyonii* M. Ownbey is a corrected spelling.

IRIDACEAE (p. 31–32)

NEMASTYLIS GEMINIFLORA Nutt. This plant has the appearance of a giant blue-eyed grass, and seems to be restricted to caliche in Refugio and Goliad Counties. *6683* (oc, r, vic); *8229* (gol); *8235* (MARY, oc, r, vic).

JUGLANDACEAE (p. 34)

CARYA LEIODERMIS Sarg. Young trees only, occur along Medio Creek just above the Mission River, Refugio County. *7196* (MARY).

FAGACEAE (p. 36)

Correction: a corrected spelling is: *Quercus marilandica* Muench.

MORACEAE (p. 38)

FICUS CARICA L. Persistant after cultivation, appearing wild after many years, Refugio County. *8077* (gol, oc, r, vic); *8153* (oc).

MACLURA POMIFERA (Raf.) Schneid. Occasional armed tree in Coleto Creek bottoms, Victoria County. *8365* (gol, MARY, NY, oc, vic, VT); *8367* (gol, MARY, oc, vic, VT).

URTICACEAE (p. 38)

URTICA URENS L. The most frequent stinging nettle, often confused with *U. chamaedryoides* which generally has wider leaves and is found in shaded bottomlands. Widespread. *4716* (MO, oc, vic); *4796* (gol); *6506* (r); *6514* (MARY).

LORANTHACEAE (p. 38)

Correction: author correction: *Phoradendron tomentosum* (DC.) Gray.

POLYGONACEAE (p. 39–42)

ANTIGONON LEPTOPUS H. & A. An escaped vine with coral-pink tepals, roadsides in Refugio County. *8076* (gol, MARY, oc, r, vic, VT); *8148* (oc).
Correction: the author of *Rumex hastatulus* (p. 41) is italicized in error.

CHENOPODIACEAE (p. 43–45)

Correction: spelling correction: *Chenopodium ambrosioides* L. (p. 44).

AMARANTHACEAE (p. 46–51)

ACNIDA (AMARANTHUS) CUSPIDATA Spreng. Occasional along Mission River, Refugio County. *5927* (oc).
AMARANTHUS SCLEROPOIDES Uline & Bray. Occasional field weed, Refugio County. *7545* (oc, r).
Correction: spelling correction: *Guilleminea lanuginosa* var. *rigidiflora* (Hook.). Mears (p. 50).

AIZOACEAE (p. 54–55)

SESUVIUM MARITIMUM (Walt.) BSP. Occasional in estuarine flats along Mission River, Refugio County. *5916* (oc).

CARYOPHYLLACEAE (p. 57–59)

CERASTIUM GLOMERATUM Thuill. Occasional yard weed, Refugio County. *4829* (oc); *6570* (r); *8221* (gol, MARY, oc, r, vic).
PARONYCHIA SETACEA T. & G. Occasional prairie herb, Goliad County near Sarco Creek. *5185* (gol, oc, vic); *8589* (gol, MARY, oc, vic).
Correction: spelling correction: *Cerastium brachypodum* (Engelm.) Robins. (p. 57).

CERATOPHYLLACEAE (p. 59)

CERATOPHYLLUM DEMERSUM L. Leaflet divisions serrate on one side; frequent in ponds. Refugio County. *6007* (oc, vic); *7520* (MARY, r, TAES, VT).

RANUNCULACEAE (p. 60–61)

RANUNCULUS CAROLINIANUS DC. Occasional stoloniferous herb, Coleto Creek bottoms, Victoria County. *8364* (gol, MARY, NY, oc, vic. VT).
Correction: corrected spelling: MYOSURUS (p. 61).

BERBERIDACEAE (p. 61)

Correction: an alternate (preferred?) name for Agarito is *Mahonia trifoliolata* (Moric.) Fedde.

PAPAVERACEAE (p. 62)

ARGEMONE ALBIFLORA Hornem. subsp. TEXANA G. Ownby. Occasional in

pasture near Coleto Creek, Victoria County. *8312* (gol, MARY, oc, vic).

CRUCIFERAE (BRASSICACEAE) (p. 64–67)

ARABIS PETIOLARIS Gray. Very local on caliche hills along Hwy 59, Goliad County. *5054* (gol, oc, vic).
LEPIDIUM RUDERALE L. Occasional ranch weed, Goliad County. *5566* (oc).
MYAGRUM PERFOLIATUM L. Occasional field weed with other mustards, River Ranch, San Antonio River floodplain, Goliad County. *5204* (gol, oc, vic).
Correction: in key (p. 67) *R. islandica, R. teres.*

ROSACEAE (p. 69–71)

PRUNUS PERSICA (L.) Batsch. Occasional escape. Widespread. *5438* (oc); *6531* (r); *6592* (gol, oc, vic); *7059* (oc).

LEGUMINOSAE (FABACEAE) (p. 72–92)

ASTRAGALUS DISTORTUS T. & G. Occasional, roadsides and prairie, Goliad County. *6602* (gol, MARY, oc, vic).
CALLIANDRA BIFLORA Tharp. Scarce, caliche hills at McNamara Ranch, Goliad County. *5550* (oc, vic); *6333* (gol, oc); *7711* (MARY, TAES).
DALEA ENNEANDRA Nutt. Scarce, San Antonio River bottoms, McNamara Ranch, Goliad County. *5913* (gol, MARY, oc, vic).
*D*ESMANTHUS ACUMINATUS Benth. On caliche road fill, Refugio County. *5421* (oc, vic); *6977* (r).
DESMANTHUS VELUTINUS Scheele. Occasional on caliche hills, McNamara Ranch, Goliad County. *5898* (gol, oc, vic); *6121* (gol).
DESMODIUM CANUM (Gmel.) Schinz. & Thell. Occasional in prairie pasture, widespread. *5586* (oc, vic); *5716* (gol); *5854* (gol, MARY); *7018* (r, TAES).
GLEDITSIA TRIACANTHOS L. Local in bottomland, Coleto Creek, Victoria County. *6359* (gol, oc, vic); *8307* (gol, MARY, oc, vic, VT).
PETALOSTEMON PULCHERRIMUM (Heller) Heller. Occasional on caliche hills, Hwy. 59, Goliad County. *5557* (MARY); *5736* (gol, oc, vic).
TRIFOLIUM AMPHIANTHUM T. & G. Occasional on prairies, Victoria & Refugio Counties. *4897* (oc, vic); *8331* (gol, oc, r, vic).
TRIFOLIUM BEJARIENSE Moric. Frequent on sandy prairies, widespread. *4756* (NY, oc, vic); *4837* (gol); *8297* (gol, MARY, NY, oc, r, TAES, vic, VT).
TRIFOLIUM PRATENSE L. Occasionally cultivated and escaped, Refugio County. *8465* (gol, MARY, oc, r, vic).
VICIA DASYCARPA Terr. Occasionally cultivated and escaped, Refugio County. *8463* (gol, MARY, oc, r, vic).
VICIA LUDOVICIANA Nutt. var. TEXANA (T. & G.) Shinners. Widespread and frequent. *4667* (ENCB, oc, vic); *4758* (gol); *4836* (oc); *6629* (r); *6637* (r); *8272* (gol, MARY, vic).
VICIA MINUTIFLORA Dieter. Occasional, Refugio County. *6534* (r).
Corrections: spelling correction: *Dalea thyrsiflora* Gray (p. 81); author cor-

rection: *Desmanthus virgatus* var. *depressus* (H. & B. ex Willd.) Turner (p. 81); spelling correction: *Erythrina* (p. 82); the epithet of *Eysenhardtia texana* is capitalized in error (p. 82).

OXALIDACEAE (p. 92–93)

Correction: spelling correction in key and text: *Oxalis dichondriifolia* Gray.

ZYGOPHYLLACEAE (p. 94–95)

KALLSTROEMIA PARVIFLORA Nort. Pasture weed, Goliad County. *7990* (MARY, oc, r, TAES, vic).

MALPIGHIACEAE (p. 95)

Correction: nomenclatural change: *Thryallis angustifolia* (Benth.) O. Ktze.

RUTACEAE (p. 95–96)

CITRUS SINENSIS (L.) Osbeck. Occasionally escaped in oak mottes, Refugio and San Patricio Counties. *5839* (gol, oc, vic); *8128* (MARY, r, TAES, VT).

SIMAROUBACEAE (p. 97)

Correction: family name misspelled in key (p. xxiv) text, and index (p. 259).

POLYGALACEAE (p. 97–99)

POLYGALA POLYGAMA L. Occasional in sandy prairie pastures, Goliad County. *5173* (oc); *8585* (gol, vic).

EUPHORBIACEAE (p. 99–108)

ACALYPHA MONOCOCCA (Englem.) L. Mill. Infrequent, sandy prairie near Sarco Creek. Goliad County. *6442* (oc).

ARGYTHAMNIA SIMULANS J. Ingram. Local on caliche hills, Hwy. 59, Goliad County. *8610* (gol. MARY, oc, vic).

SAPIUM SEBIFERUM (L.) Roxb. Cultivated and often escaped, widespread tree. *5378* (gol, oc, vic); *5379* (gol. oc, vic); *7300* (r); *8328* (MARY, oc); *8632* (MARY, NY, r, TAES, VT).

Corrections: spelling correction: *Acalypha ostryifolia* Ridd. and *Bernardia myriciifolia* (Scheele) Wats. (p. 100); spelling corrections: *Croton monanthogynus* Michx. (p. 102) and 'capsule', l. 27 of key (p. 103).

CALLITRICHACEAE (p. 108)

CALLITRICHE NUTTALLII Torr. Wet sand in prairie, Goliad County. *6586a* (oc).

ANACARDIACEAE (p. 109)

RHUS AROMATICA Ait. var. FLABELLIFORMIS Shinners. Occasional on caliche hills, Hwy. 59, Goliad County. *5036* (oc); *8605* (gol, MARY, vic).

SCHINUS TEREBINTHIFOLIUS Raddi. Apparently an escape from cultivation,

Cayo del Oso, Flour Bluff, Nueces County. *8099* (MARY, VT).
Correction: author correction: *Rhus microphylla* Englem. (p. 109).

HIPPOCASTANACEAE (new family, insert p. 110)

AESCULUS PAVIA L. Shrub to small tree with red-orange flowers, San Antonio River bottoms at Hwy. 59, Goliad County, and Coleto Creek, Victoria County. *4815* (gol, oc. vic); *5511* (gol, oc, vic); *8201* (MARY, NY, TAES, NY).

RHAMNACEAE (p. 111)

CEANOTHUS HERBACEUS Raf. Infrequent low perennial on caliche hills, Hwy. 59, Goliad County. *8237* (go!, MARY, NY, oc, vic, VT).

MALVACEAE (p. 115–121)

HIBISCUS MOSCHEUTOS L. subsp. LASIOCARPUS (Cav.) Blanchard. St. Nicholas Lake, Greta Ranch, Refugio County. *6044* (gol, MARY, oc, pf, vic).
SIDA ELLIOTTII T. & G. Pasture, Melon Creek Ranch, Refugio County. *5310* (pf, TAES, VT).
Corrections: nomenclatural:

Allowissadula lozanii (Rose) Bates. This is incorrectly identified in the text as *Wissadula holosericea* (Scheele) Garcke which does not occur north of Cameron County.
Hibiscus militaris Cav. = *H. laevis* Allioni
Sida filicaulis T. & G. = *Abutifolia* Miller
Sida filipes Gray = *Meximalva filipes* (Gray) Fryxell
Sida physocalyx Gray = *Rhynchosida physocalyx* (Gray) Fryxell

Correction in key: p. 116 l. 2 should read 'carpels 5'; it should be noted (p. 118) that *Malvastrum americanum* (L.) Torr. does not occur north of Corpus Christi. It seems that many taxa said to be widespread in the text actually do not reach the eastern portion of the range of the *Flora.*

PASSIFLORACEAE (p. 126)

PASSIFLORA SUBEROSA L. Infrequent vine in oak motte, Rooke Ranch, Woodsboro, Refugio County. *8617* (oc, r, vic).

LOASACEAE (p. 129)

Correction: 'Sand Lily' (*Mentzelia nuda* (Pursh) Torr. & Gray) as a common name should be capitalized to be consistent with the style of the *Flora.*

LYTHRACEAE (p. 133–135)

LAGERSTROEMIA INDICA L. Both persistent after cultivation and escaped. Refugio County. *6026* (gol, oc, vic).

ONAGRACEAE (p. 135–139)

OENOTHERA MEXICANA Spach. Occasional on sandy terraces, Refugio County. *6732* (MARY, MO, oc, r, vic).

UMBELLIFERAE (APIACEAE) (p. 139–144)

HYDROCOTYLE VERTICILLATA Thumb. var. TRIRADIATA (A. Rich.) Fern. In mud along the Aransas River, San Patricio County. *6173* (oc, vic); *7021* (r).

LIMNOSCIADIUM PINNATUM (DC). Math. & Const. Occasional in marshy land, upright and larger than *L. pumilum*, widespread. *4978* (gol, oc, vic); *5256* (oc); *6759* (MARY, r); *8356* (gol, vic).

PTILIMNIUM NUTTALLII (DC.) Britt. Occasional in sandy openings, Goliad and Refugio Counties. *5149* (oc, vic); *5444* (oc, vic); *5526* (gol); *7050* (MARY, r, TAES, VT); *7254* (gol, MARY, r, VT).

OLEACEAE (p. 146–147)

LIGUSTRUM JAPONICUM Thunb. Thick-leaved hedge plant, occasionally escaped. Widespread. *6025* (oc); *8396* (gol, oc, r, vic).

LIGUSTRUM LUCIDUM Ait. Tall shrub or tree, often escaped from cultivation. Widespread. *5437* (gol, oc, vic); *6566* (r); *7182* (r).

LOGANIACEAE (p. 147)

CYNOCTONUM MITREOLA (L.) Britt. Fragile herb in wet areas. Melon Creek and the Aransas River, Refugio County. *6202* (oc, vic); *7389* (r); *7627* (r, TAES); *7766* (gol, oc, vic).

APOCYNACEAE (p. 149–150)

NERIUM OLEANDER L. Persistant after cultivation at old house sites, widespread. *6024* (gol, oc, vic).

ASCLEPIADACEAE (p. 150–152)

ASCLEPIAS ASPERULA (Dcne.) Woods. Local on caliche hills, Hwy. 59, Goliad County. *5000* (gol, oc, vic); *5469* (oc); *8231* (gol, vic).

ASCLEPIAS TUBEROSA L. Occasional in oak woodlands, Goliad County. *5528* (oc, vic); *8578* (gol, MARY, oc, vic).

CONVOLVULACEAE (p. 153–158)

CUSCUTA OBTUSIFLORA H.B.K. var. GLANDULOSA Engelm. Occasional parasite on *Persicaria*, Greta Ranch, Refugio County. *6046* (gol, MARY, oc, vic, VT).

IPOMOEA PANDURATA (L.) Mey. Field weed, Refugio County. *7991* (MARY, r, vic); *8087* (oc, r).

HYDROPHYLLACEAE (p. 159–161)

HYDROLEA OVATA Choisy. Occasional in marshy prairie sites, Refugio County. *6050* (gol, oc, vic); *7555* (MARY, r, TAES).

BORAGINACEAE (p. 161–165)

BUGLOSSOIDES (LITHOSPERMUM) ARVENSE (L.) I. M. Johnst. Infrequent roadside weed, Goliad County. *6587* (gol, oc, vic).

ONOSMODIUM BEJARIENSE A. DC. Occasional on caliche hills, Hwy. 59, Goliad County. *5480* (gol, oc, vic); *8601* (gol, MARY, oc, vic).
Correction: key error: p. 161, l. 10, eliminate 'calyx not as above' after *Myosotis*. It leads nowhere.

VERBENACEAE (p. 165–168)

LANTANA CAMARA L. Outer flowers lavender, inner ones white or pink, frequent escape from cultivation, Refugio County. *6028* (oc); *8147* (gol, oc, vic); *8576* (MARY, r).
LANTANA MONTEVIDENSIS (Spreng.) Briq. Prostrate shrub, roadside escape near Mission River and Hwy. 77, Refugio County. *7998* (gol, MARY, r, vic, VT).
Corrections: key correction: p. 166, '*L. macropoda*'; author of *Verbena ciliata* (p. 168) should not be italicized.

LABIATAE (LAMIACEAE) (p. 169–174)

Corrections: spelling correction: *Micromeria brownei* var. *pilosiuscula* Gray (p. 170); species of *Teucrium* (p. 174) not in alphabetical order.

SOLANACEAE (p. 174–178)

Corrections: nomenclatural change: *Capsicum annum* L. var. *minimum* (Miller) Heiser (p. 175). author and spelling correction; *Physalis viscosa* L. var. *spathulifolia* (Torr.) Gray (p. 177); spelling correction: *Solanum elaeagnifolium* Cav. (p. 178).

SCROPHULARIACEAE (p. 179–183)

PENSTEMON TENUIS Small. Pasture on McNamara Ranch, Goliad. *5533* (oc).
Corrections: nomenclatural changes: *Gerardia* = *Agalinis* (p. 180–181) (*Gerardia* applies to a tropical genus in the Acanthaceae) *Agalinis fasciculata* (Ell.) Raf. *Agalinis maritima* (Raf.) Raf. *Agalinis heterophylla* (Nutt.) Small *Agalinis strictifolia* (Benth.) Penn.

BIGNONIACEAE (p. 183)

BIGNONIA CAPREOLATA L. Occasional vine in trees, Coleto Creek bottoms, Victoria County. *6366* (gol, oc, vic); *8369* (MARY, oc).
CATALPA SPECIOSA Warder. Infrequent tree, Coleto Creek bottoms, Victoria County. *8370* (gol, MARY, oc, vic, VT).

LENTIBULARIACEAE (p. 183–184)

UTRICULARIA GIBBA L. Probably misinterpreted as *U. biflora* Lam. in the text. Refugio County. *5975* (MARY); *5993* (gol, oc, vic).

ACANTHACEAE (p. 184–186)

RUELLIA HUMILIS Nutt. var. LONGIFLORA (Gray) Fern. Occasional on open prairie near Sarco Creek, Goliad County. *5708* (gol, oc, vic).

PLANTAGINACEAE (p. 188)

Correction: the type face should be larger and the common name, 'Plantain Family', should have been included to be consistent with the text.

RUBIACEAE (p. 188–192)

GALIUM PROLIFERUM Gray. Locally common on caliche hills, Hwy 59, Goliad County. *8620* (gol, MARY, NY, oc, TAES, vic, VT).

VALERIANACEAE (new family, add p. 195)

VALERIANELLA STENOCARPA (Engelm.) Krok. var. PARVIFLORA Dyal. Occasional in bottomland and along Fleming Prairie Rd., Coleto Creek, Victoria County. *8294* (gol, MARY, NY, oc, TAES, vic, VT).

COMPOSITAE (ASTERACEAE) (p. 195–230)

ACHILLEA MILLEFOLIUM L. Infrequent around ranch houses, River Ranch, Goliad County. *7058* (gol, MARY, oc, vic).

ASTER TEXANUS Burgess. Occasional in Coleto Creek bottoms, Victoria County. *6365* (oc, vic).

CENTAUREA MELITENSIS L. Roadside weed, caliche hills, Hwy. 59, Goliad County. *5483* (oc).

CHAETOPAPPA BELLIDIFOLIA (Gray & Engelm.) Shinners. Caliche hills, Hwy. 59, Goliad County. *5052* (gol, oc, OS, vic); *8242* (gol, MARY, oc, r, vic, VT).

GRINDELIA SQUARROSA (Pursh) Dun. Roadsides near McNamara Ranch, Goliad County. *6126* (gol, oc, vic).

HELIANTHUS GROSSE-SERRATUS Martens. Occasional in Coleto Creek bottoms, Victoria County. *6361* (gol, oc, vic).

LACTUCA LUDOVICIANA (Nutt.) Ridd. Occasional and widespread in pastures and roadsides. *5700* (oc, vic); *8421* (MARY, oc, vic, VT); *8550* (MARY, r).

RATIBIDA TAGETES (James) Barnh. Infrequent on caliche hill, Hwy 59, Goliad County. *5897* (oc).

SOLIDAGO RADULA Nutt. Occasional in pastures, Refugio County. Leaves very rough to the touch. *6316* (oc, vic); *6347* (gol, oc); *7898* (r).

VERNONIA ALTISSIMA Nutt. Infrequent along Melon Creek, Refugio County. *6205* (gol, oc, vic).

Observations: several plants listed in the text were 'not seen in recent years.' In the Compositae, the following have been relocated: *Marshallia caespitosa* Nutt. (p. 220), large colony along Hwy. 77A near Sarco Creek, Goliad County. *6295* (gol, oc, vic); *8627* (gol, MARY, NY, oc, vic, VT). *Thurovia triflora* Rose (p. 227), frequent on open prairie. Greta Ranch, Refugio County. *6377* (gol, MARY, oc, OSU, pf, TAES, TEX, vic, VT). *Vernonia missurica* Raf. (p. 227), occasional at Melon Creek south of Hwy. 774, Refugio County. *5963* (oc).

Correction: key correction: p. 198. l. 7–13, a lead has been left out in this key causing problems in procedure. The proper sequence of leads with the missing lead inserted is as follows:

"Phyllaries in . . .
Ligules up to . . .
Ligules 3 mm. . . .
Pappus of scales, teeth, or short hairs, or lacking
Heads 5–9 mm. wide
Rays . . .
Rays . . .
Heads 10–35 mm. wide "

key correction: p. 197, l. 46, eliminate "Pappus of bristles or . . ." — there is no complimentary lead. Spelling error: p. 199, l. 8 *Pterocaulon* (also p. 222). key correction: p. 200, since the base of the disc corollas *is* enlarged in *Aphanostephus kidderi*, the key should read at this point: "Well-developed involucres 6–8.2 mm high, rays

8–15 mm long . . . . *A. skirrhobasis*
Well-developed involucres 4.5–6.3 mm high, rays
6–8 mm long . . . . *A. kidderi* "

correction: p. 210, l. 21, should be *E. compositifolium*. Walt.
spelling correction: *Hymenopappus artemisiifolius* DC (p. 215).
key correction: *Liatris* (p. 218–219) change appropriate portion to:

"Pappus bristles shortly appendaged . . . . *L. acidota*
Pappus bristles with long appendages. feathery
Inner phyllaries with elongated, colored tips . . .
Inner phyllaries without elongated, colored tips . . ."

nomenclatural note: *Verbesina microptera* DC. is best treated as a synonym of *V. virginica* L. (p. 227).

APPENDICES

Corrections: *Boerhavia mathisiana* F. B. Jones was first described in edition 1 of this work in 1975, and its reprinting here confuses the botanical literature and should not have been included (p. 231–232).

The INDEX contains numerous errors and ommissions. In addition to the new records listed here, the following genera included in the text were left out in the index: *Amsonia*, 150; *Apocynum*, 150; *Aspicarpa*, 95; *Najas*, 4. Alphabetical order was not followed in the following: *Engelmannia*, *Eurytaenia, Eustoma, Euthamia, Ludwigia, Lupinus*, pitaya.

In summary, 96 new records have been added to Jones' Flora of the Texas Coastal Bend as a result of this study. In addition, numerous spelling corrections, key adjustments, and nomenclatural notes have also been pre-

sented to supplement this excellent volume.

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THIRTY ADDITIONS TO THE VASCULAR FLORA OF KENTUCKY

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Since the preparation of a list of additions to the flora of Kentucky by Cranfill and Medley (1981), a number of additional records have come to our notice. While most are discoveries from field work in 1979 and 1980, a few are older collections. Several records are the result of ongoing studies of flora and vegetation of Hardin County, located just south of the Ohio River on the north central portion of the Mississippian Plateau, and of far northern Kentucky.

Where possible, nomenclature follows Radford, Ahles, and Bell (1968). Vouchers are deposited in the herbaria of the University of Kentucky (KY) or of Northern Kentucky University (KNK).

We are grateful to Dr. Dan K. Evans, Dr. A. A. Reznicek and the late Dr. Ernest O. Beal for confirming some of our determinations, to Max E. Medley for help in many ways, and to Dr. William Meijer for extending to us the facilities of the herbarium of the University of Kentucky.

DRYOPTERIS × TRIPLOIDEA Wherry. Henry Co.: scrubby oak-juniper-maple woods on N facing slope, ca 3 mi WSW of Lockport at W edge of Gratz topographic sheet, *Andre s.n.* (KY), 18 May 1980. With the scattered occurrence of one of the parents (*D. carthusiana* (Villars) Fuchs) in north central Kentucky, the occurrence of this hybrid in Kentucky was anticipated by Cranfill (1980). The continued existence of the hybrid at the Henry County site is in doubt as it occurs along the edge of a proposed powerline right-of-way.

POTAMOGETON PULCHER Tuckerm. Clinton Co.: shallow pools at edge of swamp forest along KY 639, ca 1 mi S of its junction with KY 90, *Cranfill 4257* (KY), 24 May 1979.

NAJAS MARINA L. Rowan Co.: floating in water ca 4 ft deep; area of boat ramp in Cave Run Lake, along highway 1274, ca 10 mi S of Morehead, *Thieret 52391* (KNK), 29 Aug 1980.

CHLORIS VERTICILLATA Nutt. Kenton Co.: roadside at intersection of

SIDA 9(1): 55–58. 1981.

Oak St. and Helen St., Ludlow, *Applegarth 221* (KNK), 1 Aug 1977.

PUCCINELLIA DISTANS (L.) Parl. Boone Co.: low spot at roadside along I-75, ca 2 miles S of Florence, *Thieret 51233* (KNK), 11 Aug 1979. The use of salt for snow and ice removal from highways has, in many places, created a roadside ribbon of soil of increased salinity. This narrow habitat may be occupied by species of halophytic plants that otherwise are uncommon in an area. For such plants the name "highway halophytes" seems appropriate.

Puccinellia distans and, mentioned below, *Suaeda depressa* and *Spergularia marina* were collected together along I-75 in a habitat that almost certainly would not have existed except for highway salting. Associated plants were various grasses (including *Hordeum jubatum*), *Atriplex patula*, and *Polygonum aviculare*. About half the soil at the site was bare.

One of the best examples of the highway halophyte habitat we have seen recently is in central Ohio where, along mile after mile of I-75, *Puccinellia distans*—a grass recorded from only one Ohio county as recently as 1967 (Braun 1967)—occurs in a dense growth of myriads of individuals. So abundant is the species there that, from the point of population size, it surely ranks high among Ohio grasses.

CAREX AUSTRINA (Small) Mack. Hardin Co.: dry, rocky limestone slope above Sand Cave, ca 1 mi NW of Eastview, *Cranfill H-952* (KY), 8 Jun 1978. This locality represents the northeastern known limit of the species.

CAREX LEPTALEA Wahl. Clinton Co.: dripping limestone ledges, with *Parnassia grandiflora*, Falls of the 76, above Lake Cumberland, along KY 734, *Cranfill 4288* (KY), 24 May 1979; Hardin Co.: dripping limestone ledges, with *Dumortiera*, W facing slope of Green Rock Hollow, ca 1 km W of Summit, *Cranfill H-728* (KY), 26 May 1978.

CAREX LUPULIFORMIS Sartwell. Hardin Co.: wet woods of sinkhole swamp forest near Vine Grove, just E of Walter Boone Roar, 0.25 mi S of its junction with KY 220, *Cranfill H-1517* (KY), 15 Aug 1978. This species has been collected by Deam (1940) in Harrison County, Indiana, just north of Hardin County.

CAREX VESICARIA L. Jefferson Co.: Corn Island, Ohio River, *Short s.n.* (KY), 1840. A specimen collected by Short, misfiled in the UK herbarium, is this species. It was not recorded by him in any of his catalogs or their supplements.

CAREX TRIANGULARIS Boeckler. Hardin Co.: wet shores of Greer's Lake on E side of KY 1375, 1.5 mi S of Franklin's Crossroads, *Cranfill H-907* (KY), 6 Jun 1978. The disjunct occurrence of this largely Mississippi Embayment sedge is another example of the relict flora that characterizes these sinkhole ponds.

JUNCUS GERARDII Loisel. Kenton Co.: low wet area in railroad yard, oily soil, west 19th at Holman, Covington, *Applegarth 465* (KNK), 11 Aug 1978.

QUERCUS × BEBBIANA Schneider. Campbell Co.: edge of woods on slope above lake, *Q. alba* and *Q. macrocarpa* nearby, Campbell County Park, ca 6 mi S of Alexandria, *Thieret 52428* (KNK), 3 Oct 1980.

SUAEDA CALCEOLIFORMIS (Hook.) Moq. (*S. depressa* auct.). Boone Co.: low spot at roadside along I-75, ca 2 mi S of Florence, *Thieret 51234* (KNK), 11 Aug 1979. See text under *Puccinellia distans* above.

SILENE CSEREI Baumg. Campbell Co.: railroad yard, Silver Grove, *Thieret 51106* (KNK), 7 Jul 1979.

SPERGULARIA MARINA (L.) Griseb. Boone Co.: low spot at roadside along I-75 ca 2 mi S of Florence, *Thieret 51235* (KNK), 11 Aug 1979. See text under *Puccinellia distans* above.

RANUNCULUS FICARIA L. Campbell Co.: lawn weed, Bluegrass Avenue at US 27, Southgate, *Buddell 108* (KNK), 24 Apr 1980.

PAPAVER SOMNIFERUM L. Hart Co.: several plants in black sandy moist soil along railroad tracks, Munfordville, *Hils 36* (KNK), 27 Jun 1979.

BERTEROA INCANA (L.) DC. Jefferson Co.: weedy area at grain elevators, Kentucky St. and 15th St., Louisville, *Thieret 50933* (KNK), 4 Jun 1979.

CARDARIA DRABA (L.) Desv. Campbell Co.: in field along US 27 ca 1/4 mi SE of junction of I-74 and US 27, Southgate, *Buddell 107* (KNK), 21 May 1980.

LEPIDIUM PERFOLIATUM L. Campbell Co.: weedy roadside along US 27, ca 3/4 mi S of Gold Spring, *Thieret 50345* (KNK), 2 Jun 1978.

LUNARIA ANNUA L. Campbell Co.: shaded roadside in oak woods, Campbell County Park, ca 6 mi S of Alexandria, *Buddell 82* (KNK), 9 May 1980.

SISYMBRIUM LOESELII L. Campbell Co.: railroad yard, Silver Grove, *Thieret 51110* (KNK), 7 Jul 1979.

EUPHORBIA FALCATA L. Harrison Co.: gravelly clearing ca 12 mi N of Cynthiana, *Thieret 51121* (KNK), 3 Aug 1979.

HELIANTHEMUM BICKNELLII Fern. Hardin Co.: rocky dry opening along powerline cut, on W side of Lucas Grove Road, ca 4 mi W of Upton, *Cranfill H-703* (KY), 26 May 1978. Although this species has not been previously reported from Kentucky, its habitat is so widespread in the western half of the state that the plant simply must be overlooked.

ELAEAGNUS UMBELLATA Thunb. Campbell Co.: edge of woods, Campbell County Park, ca 5 mi S of Alexandria, *Thieret 52240* (KNK), 11 May 1980. This Asiatic species, in cultivation as "autumn-olive," is well established at Campbell County Park. In an old nursery at the park are several large (up to 10 ft tall) individuals of autumn-olive that produce fruits in abundance. Translucent red, tart, pleasant tasting, and juicy, the fruits are relished by various birds. Numerous young plants are found at various places in the nursery and in adjacent woods, even up to 1/2 mile or more away, presumably from bird-disseminated seeds. The seeds of this species germinate freely following cold stratification for 3 months.

MYRIOPHYLLUM SPICATUM L. Bracken Co.: locally common in inlet and still, turbid water along shore of Ohio River just above Meldahl Dam, ca 2 mi E of Foster, *Thieret 52247* (KNK), 1 Jul 1980. This Eurasian species is widely naturalized and spreading in eastern North America.

LINARIA CANADENSIS (L.) Dum. McCracken Co.: railroad yard at 15th and Jackson, Paducah, *Thieret 50944* (KNK), 5 Jun 1979.

CHRYSOGONUM VIRGINIANUM L. var. VIRGINIANUM. McCreary Co.: sandy banks and lower slopes above the South Fork of the Cumberland River at and just upstream from Big Shoals, *Cranfill & Medley 4953* (KY), 16 May 1980. The plants at this station represent the northwesternmost collections to date (Stuessy 1977). The station nearest to our collection is some 50 miles east in Claiborne County, Tennessee.

CREPIS JAPONICA (L.) Benth. Campbell Co.: garden weed, persistent at least 3 years, Alexandria, *Thieret 50771* (KNK), 23 Sep 1978.

PICRIS HIERACIOIDES L. Campbell Co.: waste place along River Road, ca 2 miles NW of California, *Thieret 48933* (KNK), 7 Nov 1975.

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N=7654

NEW COMBINATIONS IN *CROPTILON* (COMPOSITAE-ASTEREAE)

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Hall (1928) in his phylogenetic monograph of *Haplopappus* divided the 16 sections of North America into two series based on involucre shape. Jackson (1966) added an additional section, *Havardia*, based on a species of section *Blepharodon*. Anderson et al (1974) considered Hall's series unnatural and suggested a better grouping based on habit and chromosome numbers; one group (sections *Osbertia, Blepharodon, Havardia, Prionopsis. Isopappus, Oonopsis, Pyrrocoma, Isocoma,* and *Hazardia*) largely herbaceous with base chromosome numbers of $x = 4$, 5, or 6 and the second group (sections *Oreochrysum, Stenotopsis, Stenotus, Tonestus, Macronema, Hesperodoria, Ericameria,* and *Asiris*) largely woody with a base chromosome number of $x = 9$. They also indicated that the monotypic section *Oreochrysum* would be better treated as belonging to *Solidago* (cf. Anderson & Creech, 1975).

Not only is Hall's treatment of *Haplopappus* apparently artificial, it has become increasingly clear that many of the sections of the "sack genus" or "dustbin genus" *Haplopappus* (Correll & Johnston, 1970) represent superficially similar but phyletically unrelated genera. Several species of section *Blepharodon* have been transferred to *Machaeranthera* (Shinners 1950a; Hartman, 1976; Turner & Hartman, 1976) and some to section *Isocoma* (Jackson, 1966). Correll & Johnston (1970) treated sections *Macronema, Ericameria, Prionopsis, Isopappus* (as *Croptilon*), *Isocoma,* and *Blepharodon* (as *Machaeranthera*) as separate genera, and noted the affinities of *Macronema, Ericameria,* and the genus *Chrysothamnus*. Urbatsch (1975a, b, 1978), and Urbatsch & Wussow (1979), treated sections *Isocoma* and *Ericameria* as separate genera close to *Chrysothamnus,* transferred both species of section *Stenotopsis* (and therefore the entire section) into *Ericameria,* and noted that a species from *Ericameria* should be transferred to section *Hazardia*. Section *Pyrrocoma* was elevated to generic status by Mayes (1976). Jackson (1978, 1979) has shown genetic affinity between sections *Blepharodon* and *Hazardia,* but section *Hazardia* was treated as a separate genus by Clark (1979). Clark et al. (1980) presented SEM data which indicate no close relationship exists between sections *Pyrrocoma* and *Oonopsis*. Turner & Sanderson (1971) earlier suggested that Hall's "phylogenetic" treatment of *Haplopappus* was "more fiction than fact", and I have come to agree with them.

SIDA 9(1): 59–63. 1981.

My interest is in section *Isopappus*, a section treated as the genus *Croptilon* by Shinners (1951) and Correll & Johnston (1970). My impression earlier (Smith, 1964, 1965, 1966) was that there was no particular reason to split *Isopappus* from *Haplopappus* as *Croptilon*, even though Hall (1928) himself noted that section *Isopappus* was peripheral to this group and "could drop out of the genus without deranging the phylogenetic plan". However, as the dismantling of North American *Haplopappus* has progressed (until now scarcely a skeleton remains), I have become convinced along with those noted above that the proper treatment of section *Isopappus* is at the generic level as the genus *Croptilon*. It deserves this rank at least as much as the several other sections that have been elevated to the rank of genus. I would thus like to propose the following disposition of the five section *Isopappus* taxa in *Croptilon* (synonymy other than that listed is cited in Smith 1965):

1. CROPTILON DIVARICATUM (Nutt.) Raf., Fl. Tellur. 2: 47. 1836.
Chromosome number $n = 4$.

Occuring in sandy areas of the Gulf and Atlantic coasts from central Texas east to Florida and north to southeastern Oklahoma, southern Arkansas, and extreme southern Virginia.

2. CROPTILON **rigidifolium** (E. B. Smith) E. B. Smith, comb. nov.
Haplopappus rigidifolius E. B. Smith, Rhodora 67: 229–230. 1965.
Isopappus divaricatus (Nutt.) T. & G. var. *hirtellus* Shinners, Field & Lab. 18: 157. 1950.

Chromosome number $n = 5$.

Dr. B. L. Turner et al. (U. of Texas at Austin) have provided data (pers. comm. and loan of herbarium material from LL) that show a mixed population of $n = 5$ and $n = 6$ in *C. rigidifolium* from one area (2 mi. E. of Elgin) in Bastrop County, Texas. There is no evident morphological differences between the $n = 5$ and the $n = 6$ individuals in the population; therefore, I assume that the $n = 6$ individuals are carrying a pair of B chromosomes and would thus be $n = 5^{II} + B^{II}$.

Occuring in sandy areas of southern Texas and northeastern Mexico. There is no doubt that this species is different from *C. divaricatum* and not merely a variety of that species (as treated by Shinners). It has a different range, is easily separable morphologically, has a different chromosome number (the chromosomes clearly differ cytologically from those of *C. divaricatum*), and will not even hybridize with *C. divaricatum* (Smith, 1965, 1966).

3. CROPTILON HOOKERIANUM (T. & G.) House, N.Y. State Mus. Bul. 223–234: 61. 1921. var. HOOKERIANUM

Chromosome number $n = 6$.

One population (southeast of La Grange in Fayette County, Texas) of this variety is known to be consistently $n = 7$. The individuals of the population are not distinguishable morphologically from normal $n = 6$ individuals of var. *hookerianum*; thus, the population is assumed to be carrying a stable pair of B chromosomes, and could be represented as $n = 6^{II} + B^{II}$.

Occuring on gravelly roadsides, endemic to southern Texas. While I did not explicitly say so, I earlier was of the opinion (Smith, 1965) that since Shinners (1950b, 1951) and Waterfall (1960) were using the epithet "hookerianum (-us)" for *both* the $n = 5$ taxon from Kansas/Oklahoma/northern Texas (here treated as *C. hookerianum* var. *validum*) and the $n = 6$ taxon from southern Texas (here treated as *C. hookerianum* var. *hookerianum*), that the name was a source of confusion and should be rejected. I adopted the next earliest name in *Haplopappus* and treated this and the next two taxa at the subspecies level under *H. validus*. In the intervening 16 years since my earlier publication, I have come to recognize that "hookerianum" is the proper epithet for the species, and now prefer the category variety for the infraspecific variation in *C. hookerianum*.

4. CROPTILON HOOKERIANUM (T. & G.) House var. **validum** (Rydb.) E. B. Smith, comb. nov.

Isopappus validus Rydb., Brittonia 1: 100–101. 1931.

Chromosome number $n = 5$.

Some individuals of this variety also carry B chromosome (Smith, 1965).

Occuring in sandy soil from central Kansas to northern Texas (a few exceptional populations along the Arkansas River in Arkaansas).

5. CROPTILON HOOKERIANUM (T. & G.) House var. **graniticum** (E. B. Smith) E. B. Smith, comb. nov.

Haplopappus validus (Rydb.) Cory subsp. *graniticus* E. B. Smith, Rhodora 67: 236. 1965.

Croptilon divaricatum (Nutt.) Raf. var. *graniticum* (E. B. Smith) Shinners, Sida 3: 348. 1969.

Chromosome number $n = 7$.

Some individuals of this variety also carry B chromosomes.

Occuring on thin sandy soil over grantic outcrops in the Central Mineral Region of Texas (endemic). An exceptional population southeast of La Grange in Fayette County, Texas was mentioned earlier in this paper (and in Smith, 1965); it probably represents *C. hookerianum* var. *hookerianum* with a stable pair of B chromosomes. Cytogenetic information supporting the recognition of each of the three varieties of *C. hookerianum* was published earlier (Smith. 1965, 1966).

ACKNOWLEDGEMENTS

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suggestions in his review of an earlier draft of this paper, for his consideration in providing unpublished data on chromosome numbers of *C. rigidifolium*, and for the herbarium loan from LL. Lloyd, if you can hear me: You were right about section *Isopappus*!

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DISTRIBUTION OF *SCHOENOLIRION WRIGHTII* (LILIACEAE) AND *BARTONIA TEXANA* (GENTIANACEAE)

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ABSTRACT

Distribution information was obtained for two proposed endangered species, *Schoenolirion wrightii* and *Bartonia texana*. Eighteen current populations of *Schoenolirion wrightii* were observed with 10 located in Texas, five in Arkansas and three in Alabama. This taxon occurs in prairie-like openings among woodland which are likely a result of edaphic factors. *Bartonia texana*, in contrast, is generally encountered on gentle forested slopes with seeps and springs and occasionally along banks of shallow clear running creeks. Nine populations were found in five East Texas counties. Additional populations of both species are likely to exist. Findings indicate that these two species are more abundant and more widely distributed than originally suspected.

Schoenolirion wrightii Sherman is a bulbous, rhizomatous grass-like lily with basal leaves and a scape with whitish flowers (Fig. 1). Because this species was proposed endangered by the U.S. Fish and Wildlife Service, a search was initiated to determine the status of this taxon.

In the spring of 1978, *Schoenolirion wrightii* was collected from Jasper County in East Texas (Nixon et al. 1980). It had been collected earlier from Austin (one location), Brazos (six locations), Hardin (one location), Waller (one location) and Walker (three locations) counties and from "on the Colorado River." Sites were revisited and additional sites were searched with the following results: Brazos County (two locations), Fayette County (one location), Grimes County (one location), Jasper County (two locations) and Walker County (four locations) (Fig. 2). As a result, 10 current populations are known to exist in Texas. It's likely that other populations are present.

East Texas populations of *Schoenolirion wrightii* occur in natural prairie-like openings among woodland. These openings appear to be a result of edaphic factors. The soils, which are somewhat hydric during flowering, are sandy loams or sandy clay loams of the Browndell and Kitterll Soil Series. Soil pH ranged from 5.5 to 6.3. It's likely, therefore, that the distribution of *S. wrightii* is edaphically restricted or at least a result of edaphic conditions. Also of interest is the reoccurrence of certain associated species such as *Arenaria drummondii, Gratiola flava, Hymenoxys linearifolia, Chaetopappa asteroides, Phlox cuspidata, Hypoxis hirsuta, Allium drummondii* and the

SIDA 9(1): 64–69. 1981.

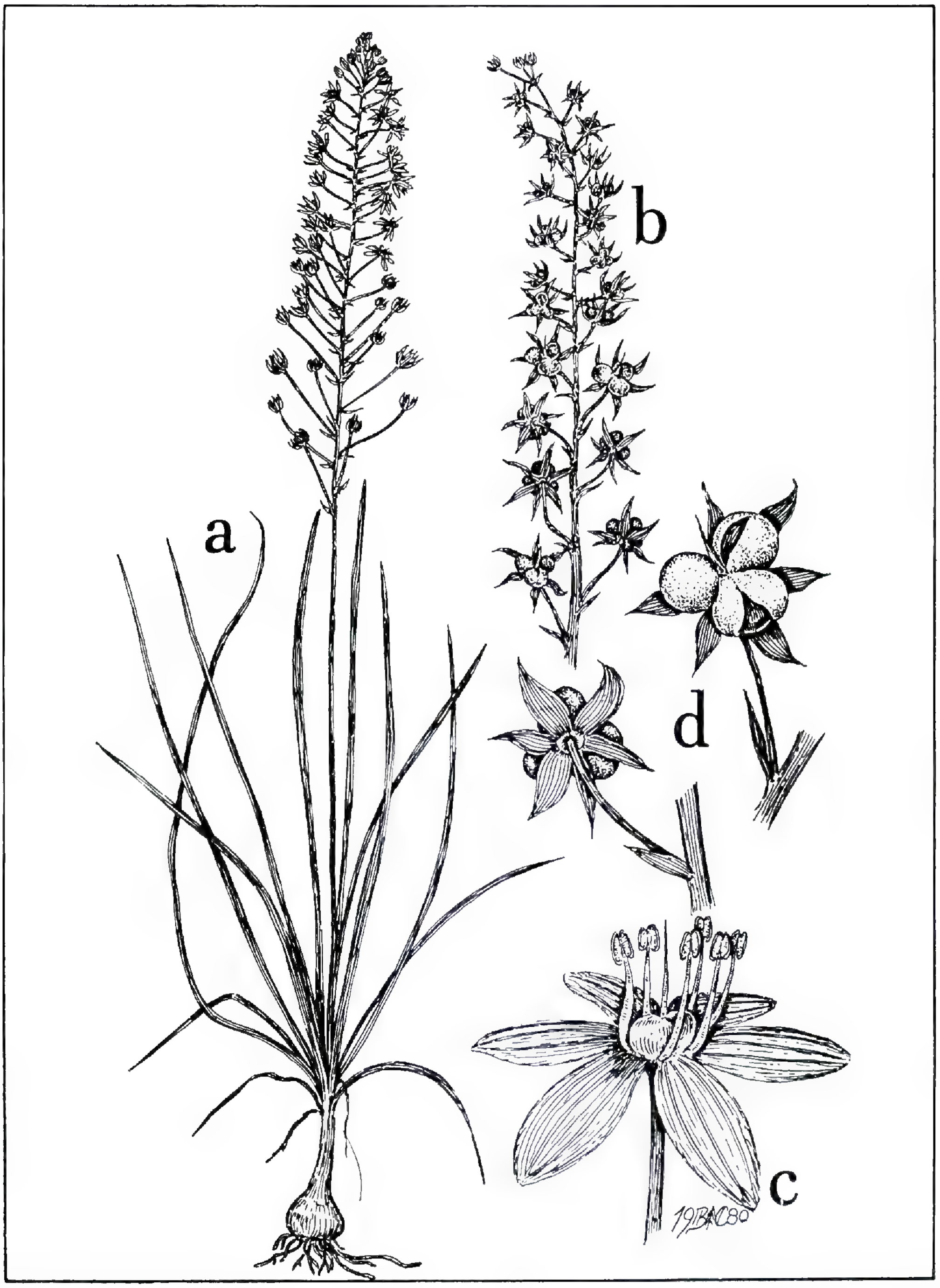

Fig. 1. *Schoenolirion wrightii*: (a) habit (b) inflorescence (c) flowers (d) fruit.

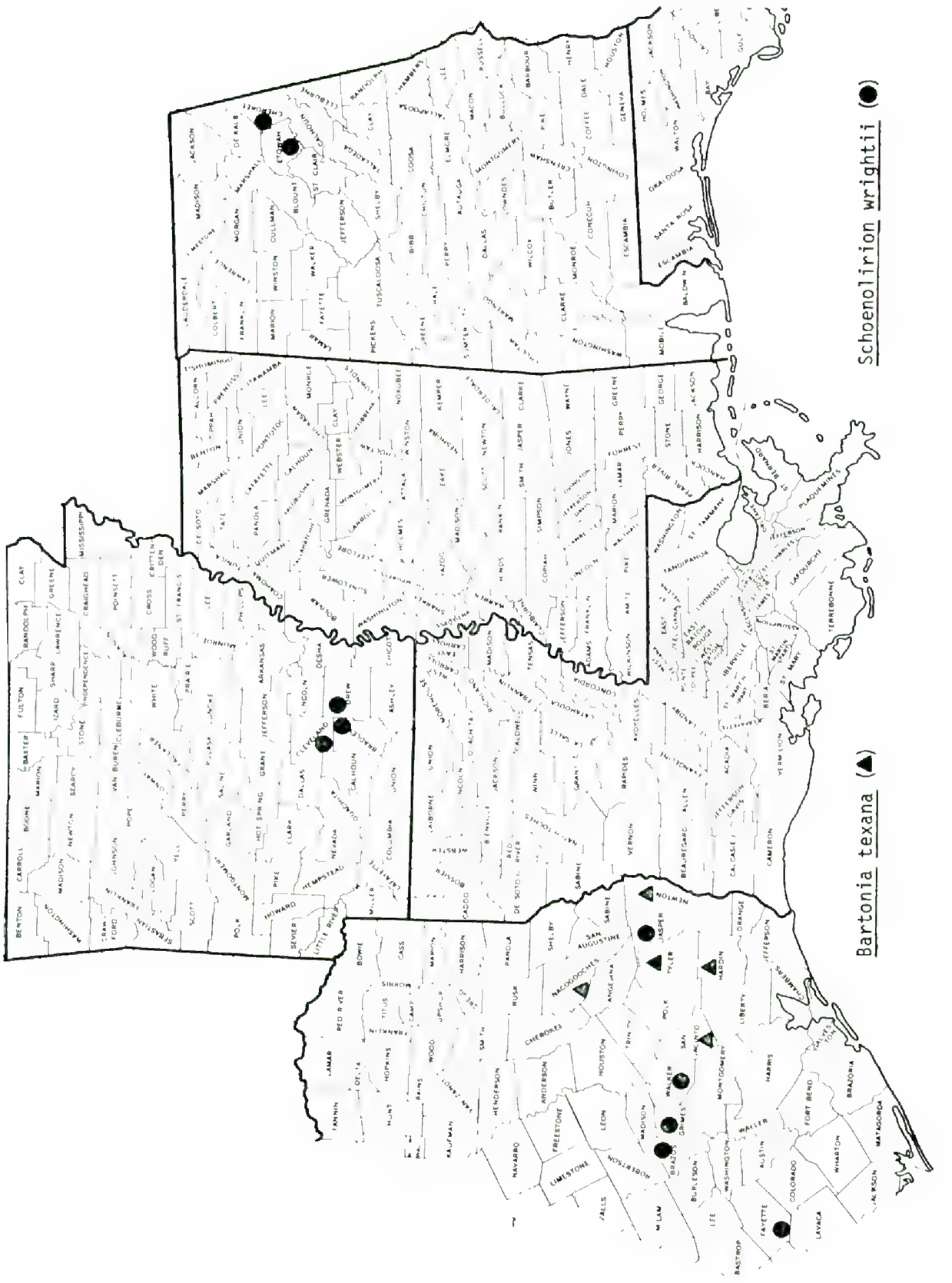

Fig. 2. Distribution by county of *Schoenolirion wrightii* and *Bartonia texana*.

bluegreen alga *Nostoc.*

The taxon was collected in 1963 from Calhoun County in Arkansas. The suspected site was searched without success. However, the species was located on a natural prairie-like area near Warren, Arkansas in Bradley County. Plants were growing on a loamy soil of the Lafe Soil Series. The pH was 7.5. Again the distribution of *Schoenolirion wrightii* appeared to be edaphically controlled so other Lafe "prairies" were searched. Three populations were located in Bradley County, one in Drew County and one in Cleveland County (Fig. 2). Its almost certain that this taxon will occur on Lafe soils of other counties. Associated species were *Senecio plattensis, Hypoxis hirsuta, Drosera annua. Fimbristyles puberula,* and *Dichanthelium angustifolium.*

Schoenolirion wrightii was more difficult to locate in Alabama. It was previously collected from Cherokee, Cullman, DeKalb and Etowah counties. Although the species was restricted to sandstone outcrops, the openings were small and therefore not mapped. These openings occurred in various soil series (mostly Hartsells). Forests were almost continuous thus greatly hampering the sighting of sandstone outcrops. Three previously known populations were re-located, one in Cherokee County and two in Etowah County (Fig. 2). Although much of northern Alabama was visited, no additional populations were located. Accompanying species were *Sedum smallii, Arenaria groenlandica* and *Lindernia monticola.*

In all, 18 current known poulations of *Schoenolirion wrightii* exist in three states. The taxon, therefore, is more prevalent than it was initially thought to be and thus somewhat surprising that it was not more often collected.

On 10 October, 1965 Donovan S. Correll found a colony of a distinctive *Bartonia* which he named *Bartonia texana* (Correll 1966) (Fig. 3). It was discovered along Clear Fork Creek just east of Colmesneil, Texas. This was the only known population of this species until 1975 when it was encountered just south of Nacogdoches, Texas in the Stephen F. Austin Experimental Forest. The rarity of this taxon resulted in its being proposed as an endangered species by the U.S. Fish and Wildlife Service and this, in turn, prompted field searches to properly determine its status.

Bartonia texana is generally encountered on gentle forested slopes with seeps and springs and occasionally along the banks of shallow clear running creeks. Plants are usually found growing on slightly elevated clumps of mosses and liverworts which are associated with tree bases, roots, and small logs in these wet areas. Commonly associated trees and shrubs are *Magnolia virginiana, Nyssa sylvatica, Acer rubrum, Itea virginica, Alnus serrulata, Cyrilla racemiflora,* and *Ilex coriacea.* Many habitats of this type were searched in eastern Texas with the following results: Hardin County (one population), Nacogdoches County (one population), Newton County (five populations), San Jacinto County (one population) and Tyler County (one

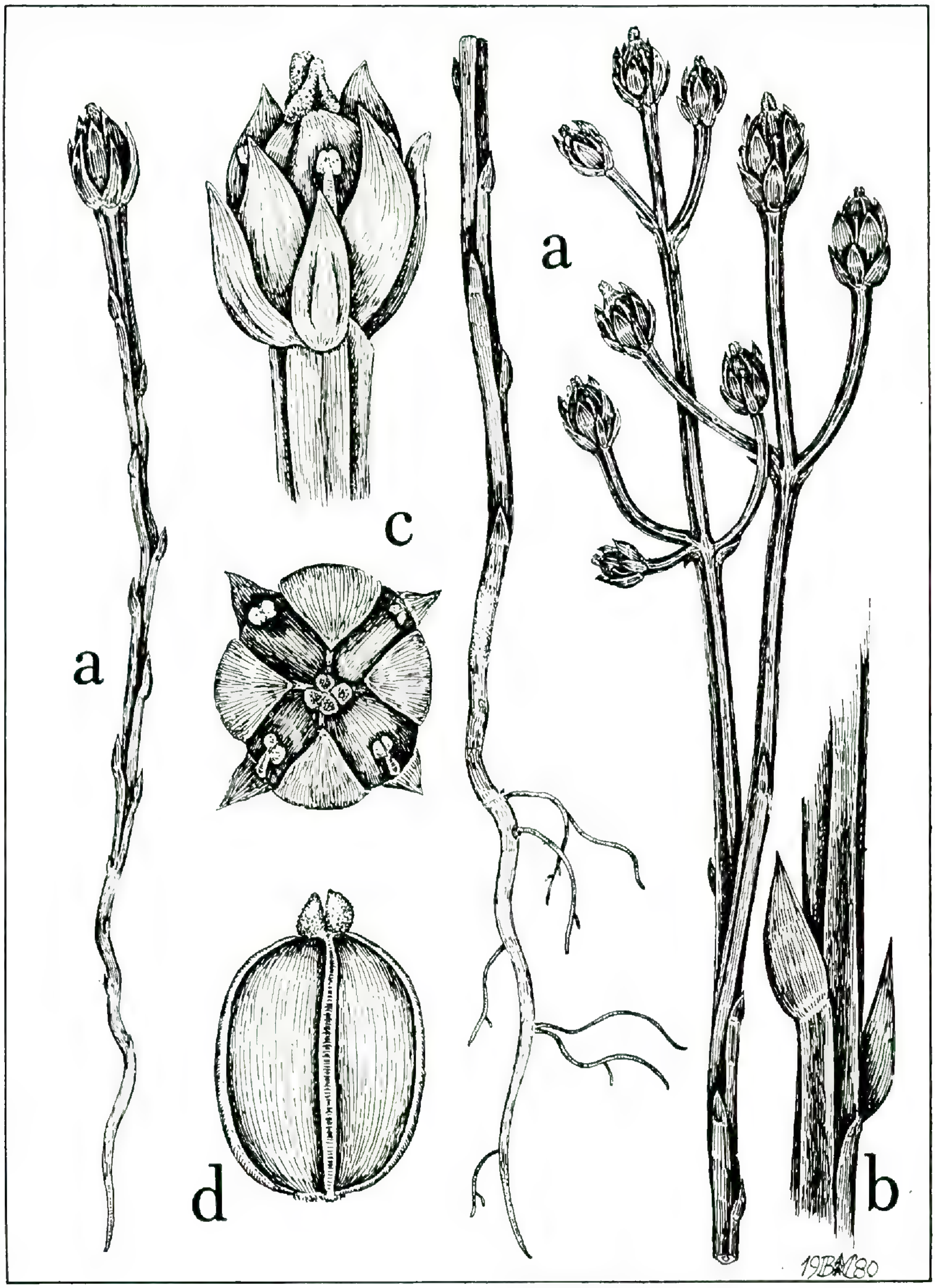

Fig. 3. *Bartonia texana*: (a) habit, (b) stem with leaves, (c) flower, (d) fruit.

population) (Fig. 2). This species, therefore, was also more widely distributed than suspected. Its also very likely that other populations exist. *Bartonia texana* is so small and inconspicuous that botanists evidently tend to overlook its occurrence in nature.

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NOTEWORTHY VASCULAR PLANTS FROM LOUISIANA

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Older herbarium records and some recent collections have drawn our attention to fifteen vascular plant species from Louisiana. We record some of these species as new to that state; for the others we confirm their persistence in our flora or expansion of geographical range. We are grateful to a number of specialists, mentioned in the text, who have provided specimen identifications, and to the curators of the following Louisiana herabia who made their collections available for examination: LSUS, NATC, LTU, NLU, LSU, and LAF. Herbarium abbreviations are taken from P. K. Holmgren and W. Keuken, Index Herbariorum I (ed. 6), 1974.

COMMELINACEAE

MURDANNIA NUDIFLORA (L.) Brenan (*Aneilema nudiflorum* (L.) Kunth)

Subsequent to Thieret's (1966) report of this species in Lafayette Parish, *Murdannia nudiflora* has been found as a lawn weed in East Baton Rouge Parish (*Brown 21679*, LSU; *Allen 1589A*, LAF, LSU) and St. Charles Parish (*Sundell 2156*, NO). A native of Asia, *Murdannia nudiflora* is now naturalized along the Gulf Coast from Texas to Florida and northward to North Carolina (Godfrey & Wooten, 1979). Jones (1976) reported this species from Pearl River and Harrison Counties in Mississippi, while Lelong (1977) recorded it as infrequent in cultivated ground near Mobile, Alabama.

TRADESCANTIA FLUMINENSIS Vell.

Tradescantia fluminensis is widely cultivated as a house plant and is escaped in northern Florida (Godfrey & Wooten, 1979). Small (1933) gives its North American range as Florida to North Carolina. We here record this species as new to Louisiana, having observed it as a perennial herb on the Tulane University campus and elsewhere in New Orleans (*Sundell 1799*, NO). *Tradescantia fluminensis* is common as a weed under cultivated shrubs. This species is also present in Lafayette Parish (J. W. Thieret, pers. comm.).

MORACEAE

FATOUA VILLOSA (Thunb.) Nakai

Dr. Thieret reported this species as new to Louisiana and North America

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in 1964. His collections were made in Lafayette Parish in 1962, although the species was found as an occasional weed in New Orleans twelve years earlier (*DeWolf, s.n.*, NO). We have seen specimens documenting *Fatoua villosa* as an outdoor plant in Orleans, Jefferson, Iberia, Lafayette, East Baton Rouge, Concordia, and Rapides Parish. It has been found in northern Florida (*Godfrey 70116*, LAF) and near Mobile, Alabama (Lelong, 1977). In northern parts of Louisiana, and in other areas of the southeastern United States, *Fatoua* is a weed in greenhouses (Massey, 1975).

URTICACEAE

PILEA MICROPHYLLA (L.) Liebm.

Widely known as a greenhouse weed, *Pilea microphylla* is persistent in outdoor flowerbeds and lawns on the Tulane University campus, New Orleans. Collections of this annual species have been made in 1977 (*Sundell 2027*, NO), 1978 (*Darwin & Sundell 910*, NO), and 1979 (*Thomas et al. 62719*, NLU). One earlier collection (*Cocks, s.n.*, NO), without date but collected before 1927, suggests that *P. microphylla* repeatedly escapes from local greenhouses even if the species cannot survive severe winter temperatures. Small (1933) included three species in his closely circumscribed genus *Pilea*; *P. herniarioides* and *P. microphylla* he thought present in peninsular Florida, but cited the range of *P. serpyllifolia* as Florida and coastal Louisiana. Our collections, with relatively short inflorescences, do not fit Small's description of *P. serpyllifolia*, nor have we seen any specimens so determined in Louisiana herbaria.

RANUNCULACEAE

RANUNCULUS PLATENSIS Sprengel

Benson (1954) described this species as new to North America based on collections from eastern Texas (*Shinners 18330*, POM, SMU) and Houma (Terrebonne Parish), Louisiana (*Penfound, s.n.*, April 27, 1931, NO). *Ranunculus platensis*, native to South America, is distinct from others of our local *Ranunculi* in having sessile flowers with only three sepals and three petals. Keener (1976) recorded the species as very rare in the coastal plain of Florida, Louisiana, and Texas. We have seen one collection from Mississippi (*Rhodes 14558*, LTU) and many others from southeastern Louisiana, where *R. platensis* is now very common.

Listed below are the Louisiana parishes from which we have seen specimens of this species; the list is chronological, based on earliest date of collection. The pronounced range extension between the years 1964-1968 undoubtedly reflects active field work by Dr. John Thieret and his associates, whose collections are largely responsible for new parish records during that period. However, it is also quite possible that the present species may have spread rapidly throughout southeastern Louisiana after a prolonged period

of establishment following initial introduction. 1931: Terrebonne. 1958: St. Charles. 1960: Lafourche. 1963: Acadia. 1964: St. Mary. 1965: Ascension, Evangeline, Livingston, St. Tammany, Tangipahoa. 1966: Iberville, Rapides, St. Helena, St. Martin. 1968: Assumption. 1970: Jefferson. 1971: Lafayette, Orleans. 1973: Plaquemines. 1974: St. Bernard. (1976: Harrison Co., Mississippi).

CRUCIFERAE

RORIPPA HETEROPHYLLA (Blume) Williams

Stuckey (1972) gives the American distribution of this species as Central America, West Indies, Pacific Northwest, and Louisiana; Gleason (1952) also reports it as adventive in New Jersey. *Rorippa heterophylla* was earlier attributed to southern Mississippi and Louisiana by Small (in 1913 under the name *Roripa montana*, and in 1933 under the name *Radicula heterophylla*). It is distinct from others of our *Rorippa* species in being apetalous and having longer fruits. We confirm the persistence of *R. heterophylla* in Louisiana, having seen the following collections in Louisiana herbaria. Orleans Parish: *Cocks, s.n.*, Common on damp earth, New Orleans, Oct 1905 (NO); *Sundell 2186*, Tulane University campus, New Orleans, 1 Jun 1980 (NO). Rapides Parish: *Thomas et al. 56617*, LSU- Alexandria at Chambers, 20 Nov 1977 (NLU, NO). Louisiana (without date or further locality): *Penfound, s.n.*, (NO).

EUPHORBIACEAE

PHYLLANTHUS FRATERNUS Webster

This species was reported as new to the United States by Thieret (1967) after its description as a new species by Webster in 1955. *Phyllanthus fraternus* is evidently native to India and adventive in the American tropics. Thieret based his report on three Louisiana collections, two from Orleans Parish and one from Lafayette Parish. We record here the following addition collections of this species. Orleans Parish: *Ewan, s.n.*, Jul 1976 (NATC, NO); *Sundell 2103*, Nov 1977 (NO), *2104*, Nov 1977 (NO). St. Mary Parish: *Thomas et al. 27119*, Oct 1971 (NLU), *27135*, Oct 1971 (NLU), *27174*, Oct 1971 (NLU). Lafourche Parish: *Pias et al. 4602*, Sep 1979 (LSU). Lafayette Parish: *Thieret 32364*, Sep 1970 (LSU, LTU). East Baton Rouge Parish: *Pias 4468*, Aug 1979 (LSU).

CROTON LINDHEIMERIANUS Scheele

A single specimen of the genus *Croton* was collected by R. S. Cocks near Lake Charles (Calcasieu Parish) in September of 1906. In 1960 the specimen (at NO) was identified by Dr. M. C. Johnston as *Croton lindheimerianus*, a species of the south central United States otherwise unknown in Louisiana. The species is distinct from *C. monanthogynus* in having three (rather than two) styles and three (not one) seeds per capsule. However,

the Cocks specimen agrees in most respects with published descriptions of *C. pottsii* and may merit further investigation.

ACALYPHA SETOSA A. Rich.

Thieret (1963) added this species to the Louisiana flora based on two of his own collections made in 1962 and 1963. The species is now to be found scattered throughout Louisiana and elsewhere along the Gulf Coast (Lelong, 1977) to Florida (Long & Lakela, 1976). In addition to the specimens cited by Thieret from Lafayette and East Baton Rouge Parish, we list below those others which are in Louisiana herbaria. Plaquemines Parish: *Ewan 18005*, Dec 1948 (NO). Orleans Parish: *Cocks, s.n.* (NO); *Morrison, s.n.*, Jun 1921 (NO); *Bretting & Ewan 22246*, Sep 1974 (NO); *Sundell 1573*, Nov 1976 (NO), *2000*, Jul 1977 (NO), *2077*, Oct 1977 (NO); *Darwin & Sundell 900*, Sep 1978 (NO). Vermillion Parish; *Thomas et al. 56543*, Nov 1977 (NLU). St. John The Baptist Parish: *Thomas & Tycer 37560*, Nov 1973 (NLU). Tangipahoa Parish: *Thomas 46405*, Sep 1975 (NLU). East Feliciana Parish: *Thomas et al. 11490*, Aug 1968 (NLU), *11496*, Aug 1968 (NLU). West Feliciana Parish: *Curry, Martin & Allen, s.n.*, Aug 1972 (NLU). Rapides Parish: *Pias 2439*, Oct 1977 (NLU); *Thomas 61842*, Oct 1978 (NLU). Ouachita Parish: *Scurria 31*, Nov 1973 (NLU). Caddo Parish: *MacRoberts 1092*, Jul 1974 (LSUS), *1987*, Sep 1976 (LSUS).

Acalypha setosa is of morphological interest in the unusual dimorphism of its pistillate flowers, bearing typical, tricarpellate, 3-seeded ovaries in the lower portion of the pistillate spike and barrel-shaped ovaries near the apex.

VITACEAE

CAYRATIA JAPONICA (Thunb.) Gagnep.

This perennial, but herbaceous vine is a native of southeastern Asia. It was reported as new to the United States by Shinners in 1964 and is now a well established weed in New Orleans, where it is frequently found covering fences and cultivated shrubs. In Louisiana herbaria, we have found numerous collections from Orleans Parish and a few others from St. Charles, St. Tammany, Washington, and East Baton Rouge Parish. We have found no collection older than that cited by Shinners (*M. K. Rylander 167*, 8 Jul 1963, St. Tammany Parrish, SMU), although the species has been present in New Orleans since 1947 and was locally misidentified as *Ampelopsis megalophylla* (J. A. Ewan, pers. comm.).

TILIACEAE

CORCHORUS AESTUANS L.

Thieret (1967) recorded this species from Pointe Coupee, St. Landry, and Lafayette Parish. Our survey of Louisiana herbaria confirms the persist-

ence of *Corchorus aestuans* in the state, with additional collections made in Iberia Parish (*Thieret 16565*, Oct 1963, LAF). St. Martin Parish (*Thieret, s.n.*, Nov 1967, LAF), and Assumption Parish (*Sundell 2120*, Aug 1978, NLU, NO).

CONVOLVULACEAE

IPOMOEA × LEUCANTHA Jacq.

This hybrid between *Ipomoea lacunosa* L. and *I. trichocarpa* Ell. probably arose in the southeastern United States and is now a widely distributed weed in northern Latin America, Hawaii, and the Philippines (Austin, 1978), possibly as a seed contaminant in rice. Mr. Andrew McDonald, at the University of Texas, informs us that *I. leucantha* is fairly common in our area (pers. comm.) and indeed the parental species are to be found in our Gulf Coast states. *Ipomoea leucantha* resembles the tropical species *I triloba* L. but has larger fruits and sepals; it most obviously differs from *I. lacunosa* in its lavender-colored (rarely white) corollas. Our collection (*Sundell 2161*, NO, TEX, USF), identified by Mr. McDonald and by Dr. Daniel Austin, was made from a persistent and vigorous colony on the Mississippi River batture at Audubon Park, New Orleans, 2 Oct 1979.

COMPOSITAE

SILPHIUM PERFOLIATUM L.

This species, although reported from Louisiana (Small, 1933; Cronquist, 1980), is not common in the state. We have seen specimens only from Caddo Parish (*Erwin 31* and *293*, LTU) and West Feliciana Parish (*Thieret 27889*, LAF; *Darwin & Sundell 848*, NO).

RATIBIDA COLUMNIFERA (Nutt.) Woot. & Standl. (*R. columnaris* (Sims) D. Don)

Reported from Louisiana by Thieret (1969), this species is apparently sporadic along roadsides and railroads in the northern and western parishes (Kral, 1966; Cronquist, 1980). We list below collections seen in Louisiana herbaria; all were made after 1964, except the R. S. Cocks specimen in 1908. Calcasieu Parish: *Thieret 28897* (LAF). Grant Parish: *Thieret 26669* (LAF); *Allen 7032* (LAF). Ouachita or Jackson Parish: *Kral 20349* (LAF, NLU). Bienville Parish: *Moreland 305* (NLU). Bossier Parish: *Thomas 51908* (NLU). Caddo Parish: *Cocks 3502* (NO).

PALAFOXIA CALLOSA (Nutt.) T. & G.

Turner and Morris (1976) give the geographical range of this species as northeastern Mexico, Texas, Oklahoma, Arkansas, and Missouri; Cronquist (1980) also mentions populations disjunct in the Black Belt of Mississippi. We report here one Louisiana collection, determined for us by Dr. B. L. Turner: *R. S. Cocks, s.n.* "Prairies near railroad, Crowley [Acadia Parish],

Apr. 15, 1911" (NO, TEX). The described habitat and the absence of any subsequent Louisiana collections suggest that *Palafoxia callosa* is an occasional waif in our southern parishes and probably without permanent populations.

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NOTES ON RARE TEXAS AND OKLAHOMA PLANTS

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The importance of field studies has been acknowledged throughout the years. The recognition of the species habitat and ecological niche is especially important for rare endemics. To protect these species, the usual approach is to avoid all disturbances especially those of man. This attitude is common when one discusses protection from extinction. However, this approach may be the factor that exterminates those rare endemics that are pioneer species. With what is considered good range and roadside management programs, these species will automatically decrease in number of individuals because of the lack of disturbance. For pioneer species, an active management program should include plowing or blading of the habitat periodically to provide for ecesis. The time intervals for disturbance should be studied for each individual taxon.

As a result of field studies on the distribution of taxa proposed as endangered species (Federal Register 41 (117). 1976), the following taxa have been determined to be more widespread or more abundant than previously thought and are neither threatened nor endangered (Fig. 1). The field research and illustrations were supported by the Office of Endangered Species, U.S. Fish and Wildlife Service, Albuquerque, NM. The vegetation map (Fig. 1) is a composite of past researchers as enumerated in "The Mosses of Texas" (1980, SMU Herbarium, Dallas, TX).

POLYGONELLA PARKSII Cory. Fig. 2. H. B. Parks collected the species in Wilson (1937) and Atascosa (1940) counties. D.S. and H.B. Correll were apparently the first to collect the species in Leon County in 1968. During the fall of 1979, I collected plants from Leon, Atascosa, Wilson, Bexar, and Guadalupe counties.

This pioneer or invader species is restricted to deep loose sand of oak woodland south and east of San Antonio with one disjunct population in Leon County. Abundant locally, this endemic is found along graded or bladed fireguards of ranches and other disturbed areas such as vacant lots between residences. Periodic blading or grading of the roadsides would

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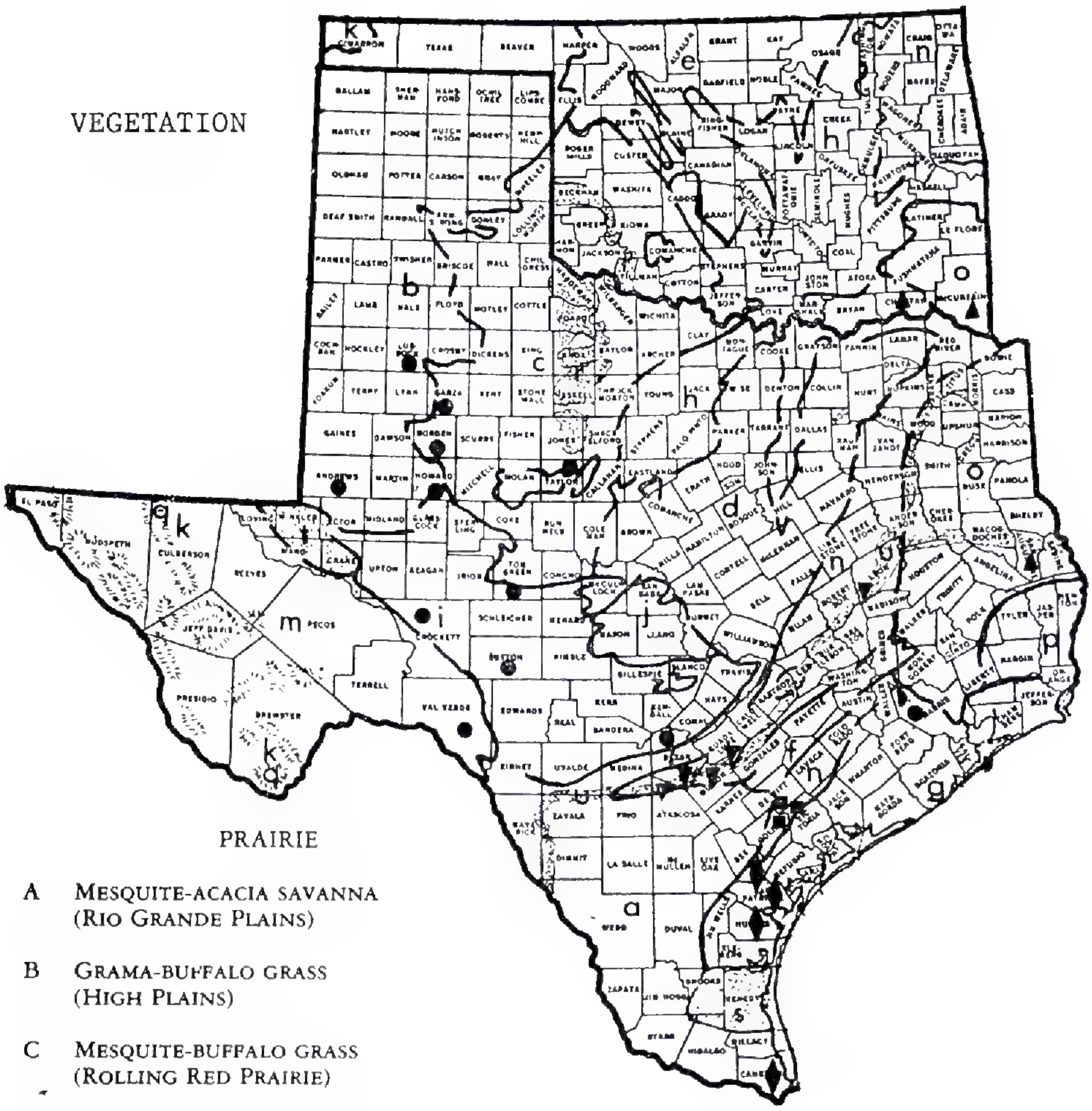
Fig. 1. Distribution of four Texas endemics (*Grindelia oolepis*–diamonds; *Machaeranthera aurea*–half circles; *Polygonella parksii*–triangles, points down; *Polygonum texense*–circles) and two rare species (*Calliandra biflora*–squares; *Leavenworthia aurea*–triangles, points up.)

VEGETATION



PRAIRIE

A MESQUITE-ACACIA SAVANNA
(RIO GRANDE PLAINS)

B GRAMA-BUFFALO GRASS
(HIGH PLAINS)

C MESQUITE-BUFFALO GRASS
(ROLLING RED PRAIRIE)

D BLUESTEM-NEEDLEGRASS
(BLACKLAND PRAIRIE)

E BLUESTEM-GRAMA GRASS
(NORTH CENTRAL OKLAHOMA)

F BLUESTEM-BUFFALO GRASS
(FAYETTE PRAIRIE)

G BLUESTEM-SACAHUISTA
(GULF COASTAL PRAIRIE)

WOODLAND

H OAK-BLUESTEM
(E & W CROSS TIMBERS-TEXAS;
CROSS TIMBERS-OKLAHOMA)

I JUNIPER-OAK SAVANNA
(EDWARDS PLATEAU)

J MESQUITE-OAK SAVANNA
(LLANO BASIN)

K PINYON-JUNIPER
(BLACK MESA & TRANS-PECOS MTNS.)

M CREOSOTE BUSH-SHRUB
(TRANS-PECOS BASINS)

FORESTS

N OAK-HICKORY
(E TEXAS & NE OKLAHOMA)

O OAK-HICKORY-PINE
(E TEXAS & SE OKLAHOMA)

P BEECH-MAGNOLIA-PINE-OAK-SWEET GUM
(BIG THICKET)

Q PINE-DOUGLAS FIR
(TRANS-PECOS MTNS.)

DEEP SAND

R SHINNERY
(N TEXAS & SW OKLAHOMA)

S MESQUITE-LIVE OAK SAVANNA
(RIO GRANDE PLAINS)

T SAND DUNES
(S HIGH PLAINS)

U CARRIZO, SPARTA, & QUEEN CITY SANDS

Fig. 2. *Polygonella parksii* Cory

increase the amount of habitat.

GRINDELIA OOLEPIS Blake. Fig. 3. R. Runyon and then J.N. Rose collected specimens from the Brownsville area (Cameron County) and sent them to S.F. Blake who described the species in 1928. Collections were made at various intervals from Cameron, Nueces, Bee, and San Patricio counties until 1964. Apparently uncollected from 1964 until 1979, I relocated 5 populations in three counties and added one new population. Field work failed to relocate the other populations. All the observed populations were growing in disturbed habitats between the highway and railroad tracks or in towns along streets.

This endemic is restricted to the black clay soils of the Gulf Coastal Bend (Corpus Christi area) and the Rio Grande Valley (Brownsville area). In October 1980, numerous plants were observed growing in the towns of Agua Dulce and Robstown along the streets, waste areas, and in an old cemetery. The blading of one population of this rhizomatous perennial along the roadsides in October 1979 was observed in October 1980 to be more densely populated than before. Evidently, moderate periodic disturbance is required to maintain the lower seral stages of succession to which it is adapted. Alfred Richardson also collected it near Brownsville, in September 1980 in a habitat where it was functioning as an invader species with little competition. This rare endemic is infrequent but locally abundant.

POLYGONUM TEXENSE M.C. Johnston. Fig. 4. The oldest collection was made by S.M. Tracy in 1902. However, recognition and publication as a distinct species did not occur until 1969. Johnston reported five counties, and with six additional counties from SMU collections, and one county and recent collections from the Angelo State University Herbarium, the total number of counties is now twelve. A specimen I collected in Taylor County in 1964 was identified during this study and the grazed mesquite pasture yielded numerous plants in a visit to the site in 1979. With the widespread occurrence of this taxon occupying the lower seral stages of succession, this endemic is more inconspicuous than actually rare.

CALLIANDRA BIFLORA Tharp. Fig. 5. The type specimen was collected in the southwestern part of DeWitt County in 1942. Two other specimens were cited in the original publication, one from western DeWitt County and one from northeastern Goliad County. M.C. Johnston collected the taxon in 1954 in Goliad County and also in 1960 from near Loreto in Tamaulipas, Mexico. Geyata Ajilvsgi studied and mapped populations in 1976, and extended the range into Victoria County. M.D. Conner also mapped populations in 1979.

This species is restricted geographically in Texas to northeastern Goliad County and adjacent DeWitt and Victoria counties. In Tamaulipas, Mexico, collections indicate a range of about 12 mi in distance. The current Texas populations mapped in 1976 and 1979, indicate the species is restricted to shallow sandy areas with a caliche substrate and apparently occurs in the

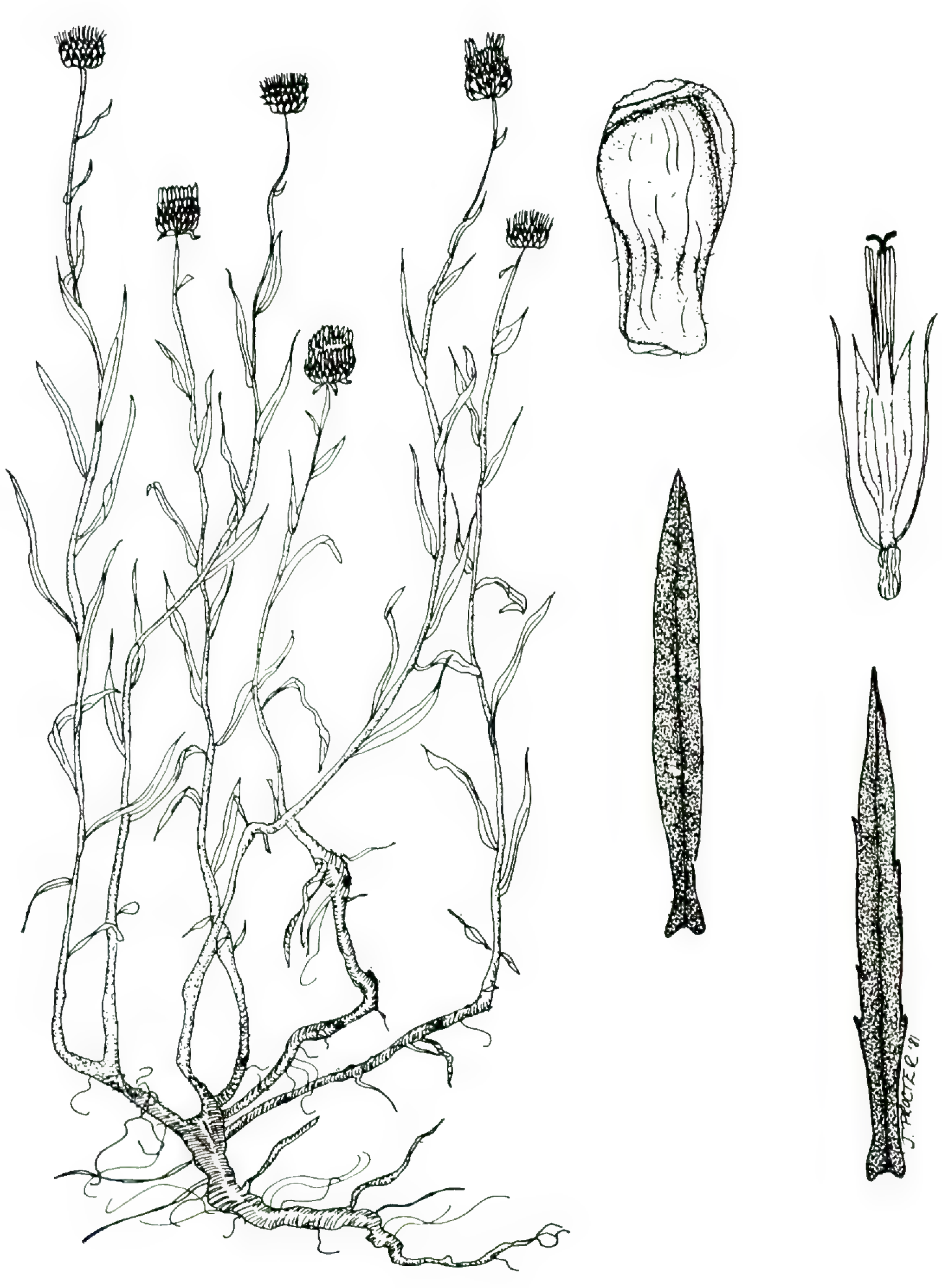


Fig. 3. *Grindelia oolepis* Blake

middle or upper seral stages of succession. With the number of individuals and number of populations, the species is neither threatened nor in danger of extinction in Texas.

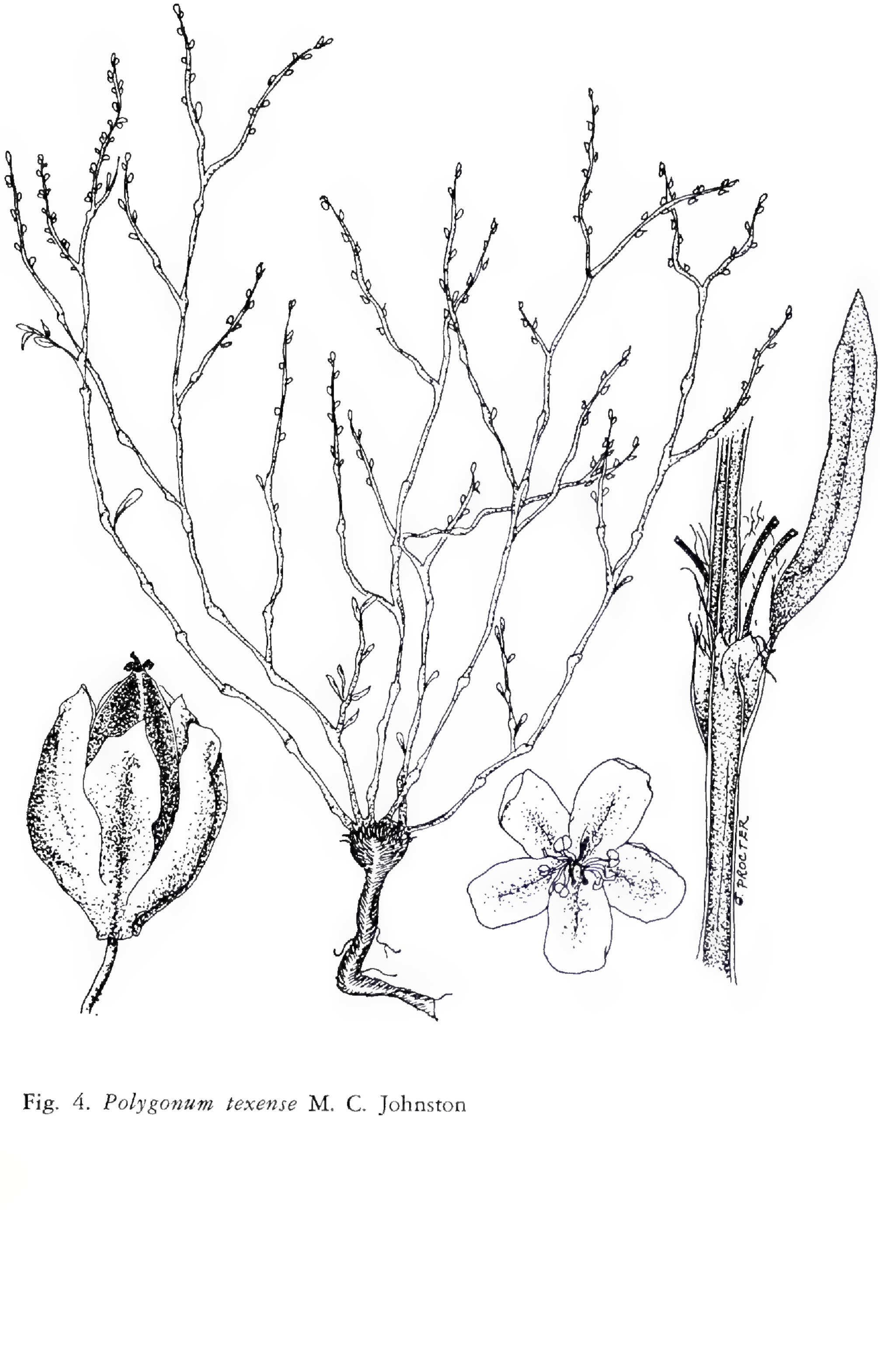


Fig. 4. *Polygonum texense* M. C. Johnston

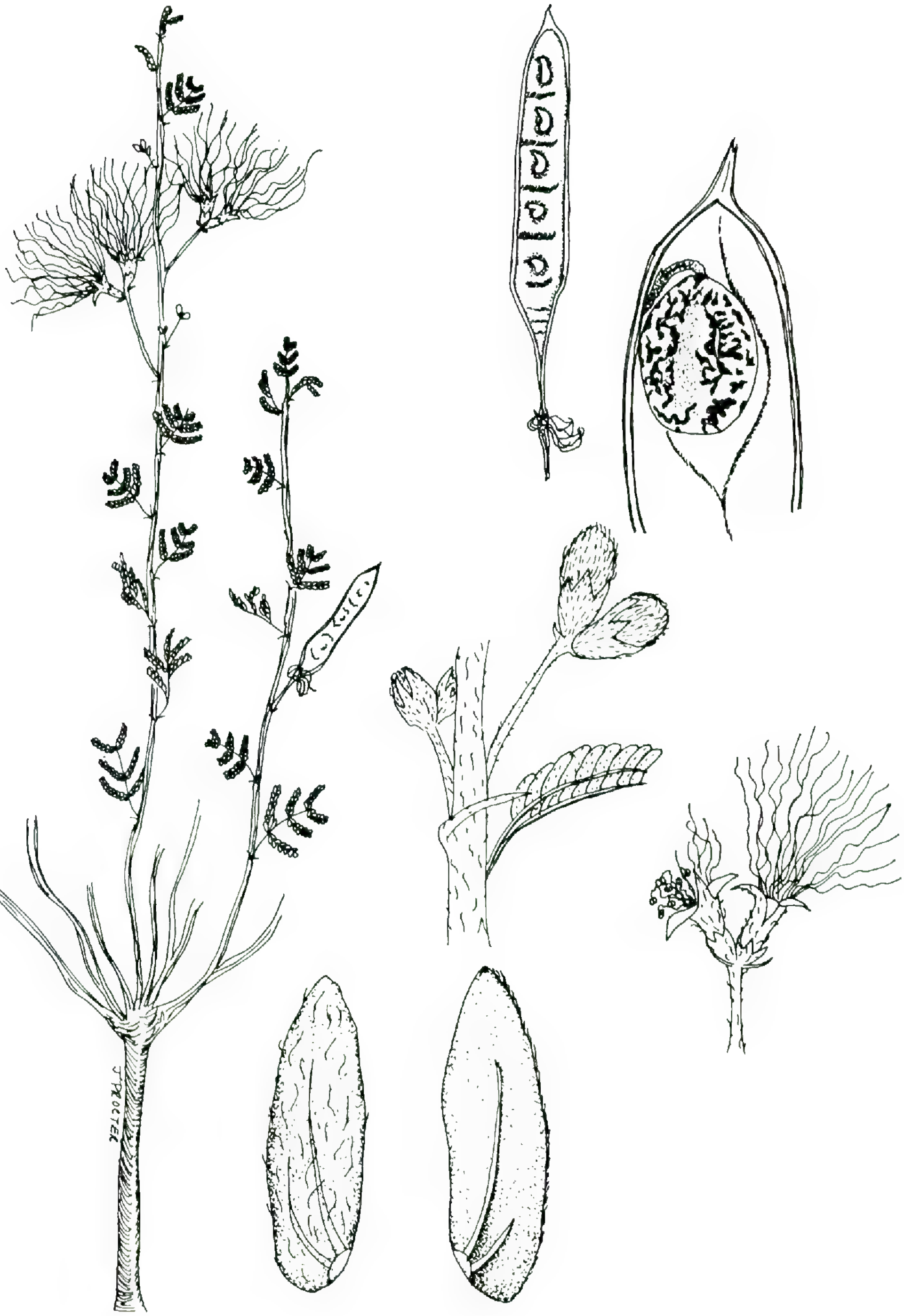


Fig. 5. *Calliandra biflora* Tharp

LEAVENWORTHIA AUREA Torrey. Fig. 6. Dr. M.C. Leavenworth, a medical officer in the U.S. Army, was stationed at Fort Towson (Choctaw County, Oklahoma) and at Camp Sabine (Louisiana) in the 1830's. In about 1835, Dr. Leavenworth collected the species at Fort Towson and shipped the specimens to Dr. Torrey who described the taxon. In 1836-37, Dr. Leavenworth apparently collected the taxon at San Augustine (San Augustine County, Texas) on a trip to Nacogdoches, Texas. These two localities are still the only known areas of occurrence for the species. The glade-like habitats may be interpreted as edaphic climaxes or as early seral stages of primary succession.

TEXAS. E.J. Palmer collected the species at San Augustine in 1915 and 1918. D.S. and H B. Correll collected in that vicinity in 1961 and 1962. In the spring of 1979 and 1980, E.S. Nixon (Stephen F. Austin State University) studied and mapped the populations around San Augustine.

The habitat is a glade-type area on seepy, wet Weches outcrops overlying an ironstone rock substrate. This taxon is a pioneer species occupying the sandy gravel of the Weches that is made up of glauconite with megafossils producing the high calcium content. This habitat has been grazed over 150 years and the populations, while not extensive geographically (about 1.5 miles in diameter), are quite stable with apparently good reproductive potential.

OKLAHOMA. McVaugh specimens in 1947 began the activity again with numerous collections taken over the past 33 years. In 1955, R.C. Rollins studied the Oklahoma populations and monographed the genus. Since 1968, the Taylors have been studying the species and in the spring of 1980, mapped the current populations.

The species is restricted to the Washita group of moist shallow limestone soils—glade type. This taxon is a pioneer or invader species of disturbed, exposed limestone. It is the first species to occur on graded (bladed) sites. Current populations occur in the Washita group extending from 5 miles west of the Arkansas state line (McCurtain County) to near Hugo (Choctaw County), over a 60 mile distance where in some areas the populations appear to be continuous for several miles. Periodic grading or blading of the roadside would enhance the populations along roadsides. This is a rare species that is locally abundant.

MACHAERANTHERA AUREA (Gray) Shinners. Fig. 7. Asa Gray described the taxon in 1849 based upon a Char'es Wright collection from near Houston (Harris County), Texas. In 1897, F.W. Thurow collected the species four miles north of Cypress, northwest of Houston. Approximately 22 miles southeast of the Thurow collection site, R.C. Jackson and E.B. Smith collected the taxon (7 Oct and 16 Oct 1964, respectively) in Houston at the junction of Highway 290 and W 34th Street. I relocated populations in the vicinity of Thurow's original collection site during the latter part of October in 1980. J.W. Kessler mapped the current populations in late

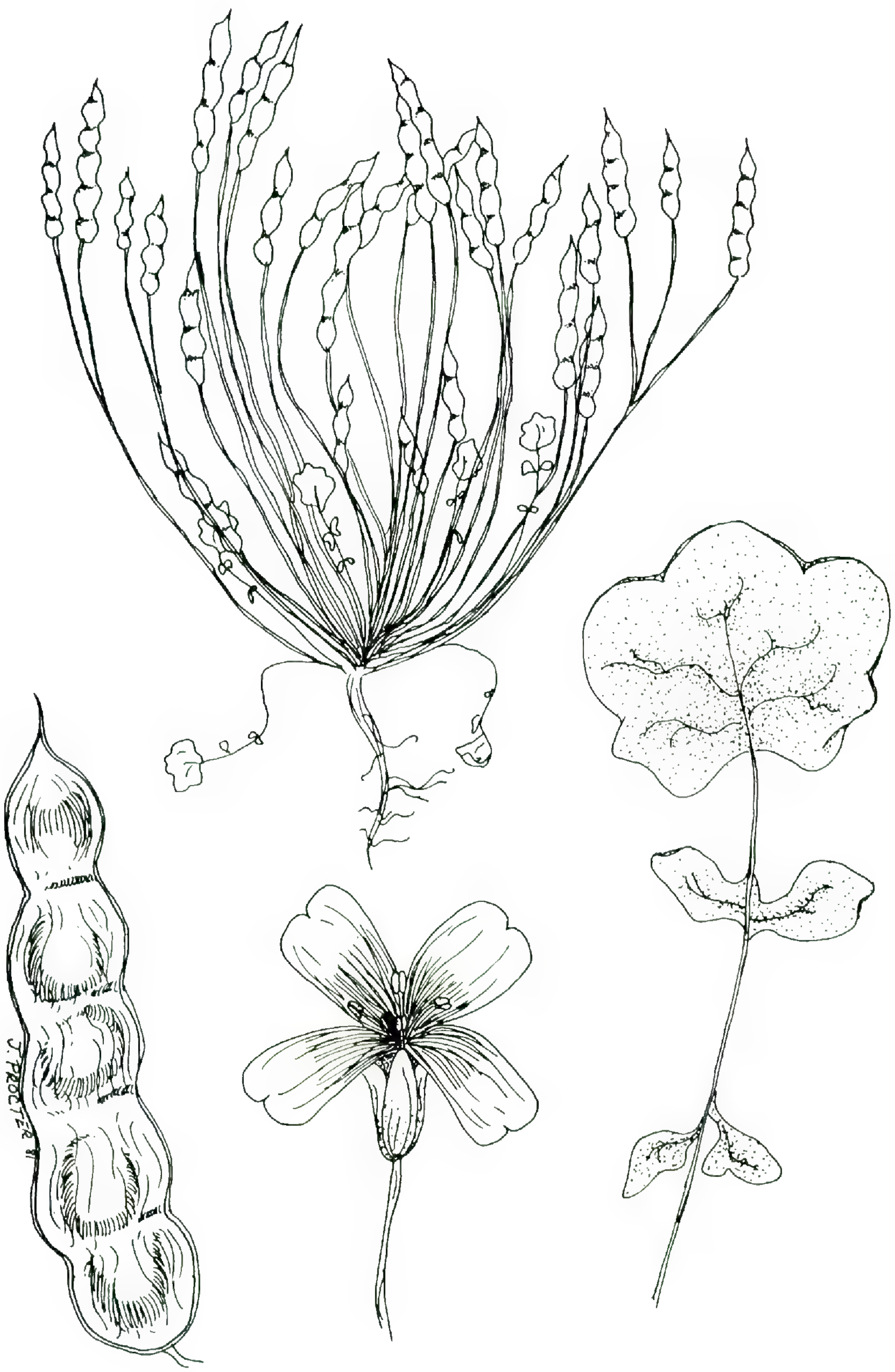


Fig. 6. *Leavenworthia aurea* Torrey

Fig. 7. *Machaeranthera aurea* (Gray) Shinners

October and early November 1980, and examined a specimen from Galveston County (TAES). This rare endemic, locally common, occurs over an 8.5 mile area between Cypress and Tomball, Texas.

This pioneer species of the first stage of plant succession occurs primarily on Gessner loam with a few populations occurring on the Wockley fine sandy loam and Clodine loam. The habitat consists of barren areas along roadsides and prairie openings with little or no competition from other plants. In areas of appropriate soils, periodic blading of the roadsides would create additional habitat for this locally common endemic. In the vicinity of Highway 290 and W 34th Street, the vacant lots and roadsides have developed too much vegetation, thus, eliminating good potential habitat of barren, exposed soils.

NOTES

TWO *DIGITARIA SPECIES* (POACEAE) NEW TO THE NEW WORLD[1]—Gould (1979) first defined the *Digitaria sanguinalis* complex as consisting of three species which were both morphologically and cytologically closely related. These annual species, commonly known as "crabgrass", included *Digitaria sanguinalis* (L.) Scopoli ($2n = 36$), *Digitaria ciliaris* (Retz) Koeler ($2n = 54$), and *Digitaria bicornis* (Lam.) R. & S. ($2n = 72$) all of which possess paired, lanceolate spikelets on a winged rachis. Based on world wide variation in this genus a number of other taxa should have been included in this complex. These include *Digitaria horizontalis* Willd., *Digitaria radicosa* (Presl.) Miq., *Digitaria setigera* Roth ex R. & S., *Digitaria nuda* Schumach., *Digitaria acuminatissima* Stapf., and *Digitaria cruciata* A. Camus. Examination of type specimens and biosystematic studies in this complex have yielded significant information as to the distribution of two of these species. The primary objective of this paper is to report two species of *Digitaria* new to the New World.

Henrard (1950) reported *D. nuda* as only occuring in West Africa, whereas, Veldkamp (1973) gave the distribution of this species as the tropics of the world. However, to the best of our knowledge, there has been no documentation of this taxon from North or South America. A survey of North Amreican *Digitaria* has shown that this species does occur in this region. *Digitaria nuda* is closely allied to both *D. setigera* and *D. horizontalis*. It differs from *D. horizontalis* by having glabrous leaves, a relatively longer second glume, and the first glume absent. *Digitaria nuda* can be separated from *D. setigera* on the basis of a second glume which is more than one-half the length of the spikelet and glabrous leaves. *Digitaria nuda* appears to be an occasional weed throughout tropical America. Specific collections of *Digitaria nuda* are as follows: ANTIGUA: British West Indies, *H. E. Box 51* (US). EL SALVADOR: Colonia San Jose del Monte, *Santos 2679* (US). HONDURAS. Departmento Morazan: *Molina R. 11128* (NY). MEXICO. COLIMA: Alzada, *A. S. Hitchcock 7069* (US). GUERRERO: *Reeder & Reeder 4406* (US), *A. S. Hitchcock 6778* (US). JALISCO: Ahualalco, *Reeder & Reeder 4444* (US). Puerto Vallarto, Accession number *2153712* (US). Michoacan: *Sohns 937* (US). SINALOA: *Rose 14166* (US). NICARAGUA: Vicinity of Managua, *Garnier 1116* (US). Chinandega, Accession number *2040125* (US). PUERTO RICO: Rio Piedras Botanical Garden, *Liogier 28834, 28900, 29020* (MAPR). TRINIDAD: San Fernando, *A. S. Hitchcock 10166* (US).

Previously, the name *Digitaria setigera* Roth has been mistakenly applied

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[1] This is a Technical Bulletin No. T.A. 16484, Texas Agricultural Experiment Station.

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to certain forms of *D. horizontalis.* American authors (Hitchcock 1936, Chase 1951, Gould 1979) place *Digitaria setigera* as a synonym of *D. horizontalis.* Whereas, the European authors (Henrard 1950, Veldkamp 1973) have treated *D. setigera* as a seperate species. In fact, the true *D. setigera* is very distinct from *D. horizontalis. Digitaria setigera* lacks papilla-based hairs on the lateral branches, lacks a first glume, and has a second glume less than 0.4 times as long as the spikelet. *Digitaria setigera* occurs throughout tropical regions of the New World. Specific collections of *Digitaria setigera* are as follows: COSTA RICA: Isla del Coco, *Jimenez M. 3191* (NY). HONDURAS: *Santos 2690* (US). JAMAICA. St. Ann Parish: *Kessler 3536* (TAES). MEXICO. Chiapas: *Webster 1984* (TAES). Quintana Roo, *Lundell & Lundell 7834* (US). UNITED STATES. Florida: Everglades National Park, *Avery 2205* (TAES).—*Robert D. Webster & Stephan L. Hatch, Department of Range Science, Texas A&M University, College Station, TX 77843.*

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NAJAS MINOR (NAJADACEAE) IN LOUISIANA—A small population of *Najas minor* All. was discovered in Lake Chicot, Chicot State Park, Evangeline Parish, Louisiana, growing in shallow water near the public boat landing. The plants were associated with *Sagittaria platyphylla* Engelm., *Potamogeton diversifolius* Raf., and *Ceratophyllum demersum* L. The population was localized, indicating that plants had probably not been introduced long enough to colonize the lake further. Three other introduced aquatic plants are known to occur in Lake Chicot: *Blyxa aubertii* Rich. (Thieret et al. 1969), *Egeria densa* Planch., and *Limnophila* × *ludoviciana* Thieret (Thieret 1972).

Only one species of *Najas, N. guadalupensis* (Spreng.) Magnus, was known to occur in Louisiana prior to this report of *N. minor. Najas guadalupensis* plants are characterized by flaccid leaves, leaf sheaths with tapering shoulders, and areolate, elliptic seeds without longitudinal ribs. Plants of *N. minor* are easily distinguished from *N. guadalupensis* and other species of water nymphs by the stiff recurved leaves of mature plants, truncately

lobed leaf sheaths, and narrow, ribbed and transversely areolate seeds with asymmetrical apices.

Muenscher and Clausen discovered *N. minor* in the lower Hudson River of New York in 1934 (Clausen 1936). According to Wentz and Stuckey (1971), this collection was not the first in North America but was antedated by an Ohio collection in 1932 from Ashtabula County. Until Wentz and Stuckey's study the Ohio specimen had been misidentified as *N. marina*. Muenscher (1944) wrote that plants of *N. minor* were probably introduced from Europe, although Clausen (1936) stated that the distribution also included Egypt, Japan, India, and the Malay Peninsula.

Since d'scovery in Ohio, the known range of the species has expanded to cover the eastern United States from Lake Ontario west to Illinois and south to northern Florida (Fore and Mohlenbrock 1966; Haynes 1979; Meriläinen 1968; Stookey, Fore and Mohlenbrock 1964; Wentz and Stuckey 1971). Meriläinen (1968) suggested that dispersal of *N. minor* might have been by waterfowl, and he illustrated the correlation of waterfowl flyways with distribution of the plants. He also wrote that plants of this species are associated with large rivers and oxbows in Europe and the United States (Hudson, Ohio, and Tennessee rivers). He suggested that ". . . it profits by river 'improvement' projects in America and tolerates pollution in some degree." Wentz and Stuckey (1971) suggested that *N. minor* has moved into waters in Ohio that have become turbid, and, as this has happened, plants of the native *N. gracillima* and *N. flexilis* have disappeared or become reduced in abundance.

Lake Chicot is managed to control aquatic vegetation by drawing the water out biennially to expose the lake bed. This practice kills the exposed aquatic vegetation and successfully controls densities of "problem" aquatic plants; however, seeds of these plants survive and germinate when the lake bed is flooded again. *Najas minor* seeds survive long droughts (Meriläinen 1968), and for this reason populations are expected to survive and spread within the lake despite the control method practiced currently.

The appearance of the plants in Lake Chicot could be due to waterfowl dispersal. The fruits and vegetative parts are eaten by shore birds as well as diving birds (Meriläinen 1968). The fate of fruits of *Najas* species eaten by birds is not known. However, even though seeds may not pass unharmed through the gut, birds could disperse fruits in mud sticking to their feet.

Collection data: LOUISIANA. Evangeline Parish: shallow water of Lake Chicot near boat landing, Chicot State Park, ca 8 mi N of Ville Platte, 3 Nov 1980, *Sullivan 1933* (LAF, LSU, FSU, SMU).—*Victoria I. Sullivan, University of Southwestern Louisiana, Lafayette, LA 70504.*

SIDA 9(1): 89. 1981.

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NEVIUSIA ALABAMENSIS (ROSACEAE) IN TENNESSEE—The known natural distribution of *Neviusia alabamensis* A. Gray, a rare shrub commonly known as snow-wreath, now includes Moore County, Tennessee. This first record for the State was confirmed by the senior author on 8 April 1979. The unusual shrub was observed by him while canoeing the Elk River on 16 April 1972, but its identity and significance were not realized until later. Previously, the species has been reported from ten counties in four states. Nine localities, representing those in Alabama, Arkansas and Missouri, were discussed by Yocom and Little (1976) and the tenth, representing a state record for Mississippi, was presented by Rogers (1979). The Missouri station has not been relocated since the discovery of a single plant by Uphof (1921) and no plants have been seen at one of the Faulkner Co., Ark., stations in over 50 years, according to Richard Davis of the Arkansas Heritage Program. The other stations apparently still support healthy populations.

The location on the Elk River, part of the Tennessee River drainage, is in the transition zone between the Central Basin and Highland Rim physiographic provinces. Rocks from the bluff site were identified as St Louis limestone, which is prevalent in the Highland Rim. Soils were characterized as cherty silt loams of the Dellrose Series (Humic hapludults family). A soil sample from the site yielded a pH of 7.6 and was relatively high in potassium. The habitat can be described further as an eastfacing wooded river bluff about 100 ft. in height. There are outcroppings of crumbling limestone or thin layers of rocky soil over most of the steep slope.

The *Neviusia* population extends from 40–90 feet above the river bank

and is about 100 yards in length. It is a dominant shrub in this portion of the slope. Trees in the overstory include *Tilia heterophylla* Vent, *Aesculus octandra* Marshall, *Acer negundo* L., *Ostrya virginiana* (Miller) K. Koch, *Juniperus virginiana* L., *Fraxinus americana* L., *Quercus muhlenbergii* Engelm., *Juglans nigra* L., and *Cornus florida* L. Associate shrubs and vines include *Hydrangea arborescens* L., *Symphoricarpos orbiculatus* Moench., *Rhus radicans* L., *Rhus aromatica* Ait., *Forestiera ligustrina* (Michx.) Poir., *Philadelphus pubescens* Loisel., and *Anisostichus capreolata* (L.) Bureau. Herbs identified from the site are *Spigelia marilandica* L., *Trillium sessile* L., *T. cuneatum* Raf., *Corydalis flavula* (Raf.) DC., *Dentaria diphylla* Michx., *D. laciniata* Muhl., *Eupatorium rugosum* Houttuyn, *Saxifraga virginiensis* Michx., *Stellaria media* (L.) Cyrill., *Elymus villosus* Muhl., *Arisaema triphyllum* (L.) Schott., *Dodecatheon meadia* L., *Cystopteris protrusa* Blasdell, *Senecio glabellus* Poir., *Cardamine hirsuta* L, *Polypodium polypodioides* (L.) Watt., *Ranunculus micranthus* Nutt., *Arabis laevigatus* (Muhl.) Poir., *Ruellia strepens* L. and *Poa* sp. Two of these taxa, *Quercus muhlenbergii* and *Dodecatheon meadia*, were noted by Rogers (1979) from the Mississippi site.

The new population in Tennessee and the one in Tishomingo County reported by Rogers (1979) fit the pattern of distribution described by Moore (1956) and lend support to his hypothesis that it is an epibiotic taxon. All of the known populations are on the upland edge of the Mississippi embayment, and thus might represent relics of a once more widely distributed taxon. The geological formations at all the known sites are Paleozoic in age, and are usually described as limestone, or occasionally shale. The limestone at this Tennessee site is from the Mississippian era. At the Arkansas stations the geological formations are either sandstone or shale from the Pennsylvanian era (Richard Davis, pers. comm.).

Other bluffs along the Elk River upstream from the site were searched for additional populations of *Neviusia*, but only one small extension to the original site was found. The site itself is on Sullenger Bend (Lois Quadrangle). Voucher specimens deposited at TENN and VDB, were collected on 8 April 1979 by the senior author and on 12 April by both authors with L. Smith, T. Patrick and G. Ramseur—*Dennis D. Horn, 222 Crestwood Dr., Tullahoma, TN 37388, and Paul Somers, TN Heritage Program, 2611 W End Ave., Nashville, TN 37203.*

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A NEW DESCRIPTION AND NEW RECORDS FOR *IPOMOEA SEPACUITENSIS* (CONVOLVULACEAE).—Only two descriptions of *Ipomoea sepacuitensis* Donn.–Sm. have been published. The original (Smith, 1913) was based only on a fruiting specimen, *Cook & Griggs 590* (US, photo F!), from the vicinity of Finca Sepacuite, Depto. Alta Verapaz, Guatemala. As recently as 1970, when *I. sepacuitensis* was included in the *Flora of Guatemala* (Standley & Williams, 1970) this species was known to Williams from only four collections, only one of these with open flowers. Standley & Williams' description of *I. sepacuitensis* is brief and, because the floral description was taken largely from label data on a specimen with closed, faded corollas, it contains some uncertainties and inaccuracies with regard to the flowers, to the extent that collections of this species cannot be identified with confidence from this work. *Ipomoea sepacuitensis* is widely distributed in Belize and eastern Guatemala, and because of its numerous flowers and huge corollas it is one of the most readily noticed and admired species in the roadside vegetation. To facilitate its identification, a new description is published here (Fig. 1).

Ipomoea sepacuitensis Donn.–Sm., Bot. Gaz. 56:59. 1913. Sinistrorsely twining vine, to 10 m or more. Young stems sparsely beset with soft, reddish-purple setae 2–5 mm long, later glabrate. Petioles 3–10 cm long, glabrous or sparsely setose. Leaf blades glabrous, 7–16 cm long, deeply 3–lobed, occasionally with 2–4 smaller secondary lobes, broadly cordate or subcordate; apices of lobes attenuate. Peduncles 12–22 cm long, the lower 1/3 sparsely setose. Flowers usually 5 in a modified dichasium, occassionally up to 10 or more; central pedicel 2.5–3.5 cm long. Calyx 1.5–2 cm in diameter at the summit. Sepals broadly elliptic, glabrous, coriaceous with hyaline margins, rounded and mucronulate at the apex, the outermost 1.5–1.8 cm long at anthesis, with a narrow margin, the others 2.2–2.5 cm long, with broad margins. Corolla glabrous, the tube 4.5–6 cm long and 1.5–2 cm in diameter, the limb 13–15 cm in diameter (fresh), open throughout the daylight hours, closing at dusk; sinuses between the lobes 7–10 mm deep. Outer part of corolla limb light pink, grading into deep rose-pink midway between the edge and the throat; limb near throat light yellow, grading into the bright yellow throat. Stamens included within the corolla tube. Fruit with accrescent sepals spheroidal, ca 3 cm in diameter, whitish.

Ipomoea sepacuitensis differs conspicuously from all forms of the wide-

Fig. 1. *Ipomoea sepacuitensis*, near Quam Bank, Belize.

spread related species *I. setosa* Ker in its completely glabrous pedicels and sepals; its much wider calyx, within which the corolla tube is scarcely narrowed; and in the broadly rounded apices of the sepals.

Specimens of *I. sepacuitensis* seen in this study: BELIZE. CAYO: road to Mai Fire Lookout Station, *Dwyer et al. 182* (MO); Roaring Creek near Big Tree, *Dwyer 10456* (MO); 9.5 mi S of Georgeville, *Croat 23442* (MO); S of Millionario, *Gentry 7787* (MO); 12 mi S of Georgeville, *Leisner & Dwyer 1584* (GH, MO). STANN CREEK: Caves, Stann Creek Railroad, *Schipp 878* (F, MO); along road from Southern Highway to Quam Bank, just W of Cabbage Haul Gap, 6.8 air km WSW of Sittee River crossing at Kendal, *Pringle 1960* (F, HAM, MO). GUATEMALA. ALTA VERAPAZ: N of Coban, *Hunnewell 17213* (GH): Montaña Yxocubvain 2 1/2 mi W of Cubilquitz, *Steyermark 44999* (F); between Limón and Chisec, *Steyermark 45121* (F). PETÉN: Santa Elena, camino Libertad, *Tún Ortíz 594* (F); Santa Elena, entre carretera Turicentro y San Francisco, *Tún Ortíz 2242* (F, MICH).—*James S. Pringle, Royal Botanical Gardens, Box 399, Hamilton, Ontario, Canada L8N 3H8. (Contribution No. 43 from the R.B.G.)*

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NOTEWORTHY PLANT RECORDS FROM CENTRAL AND DEEP SOUTHERN TEXAS—Recent ecological surveys of various natural areas of Texas, including state parks, have revealed peripheral populations of two plant species.

Aristolochia serpentaria L. Virginia snakeroot is one of several plant species which have a main geographic range in the southeastern United States with disjunct populations occurring in mesic canyon microhabitats of the Texas Hill Country (although not mentioned by Palmer, 1920, J. Arn. Arbo. 1: 233–239). Central Texas populations are known from Bandera, Edwards, Hays, Kendall, Kerr, Real and San Saba Counties (Pfeiffer, Ann. Mo. Bot. Garden 53: 115–196, 1970). Recently, I have observed two mature specimens in McKinney Falls State Bank, Travis County. Plants are growing out of adjacent cracks with associated travertine deposits in McKown Formation (Upper Cretaceous: Gulf Series: Austin Group). Most rocks of Austin Group are chalk or marl which form actively foliating cliffs. The McKown Formation is a hard limestone or heavily calcareous sandstone formed from beaches fringing the Pilot Knob atoll. The two observed specimens were 25 cm apart on exposure of McKown approximately 500 meters in length. Plants were located in area of greatest available vertical rock; elsewhere, colluvial deposits or undercut shelter reduced available vertical surfaces. Area of plant occurrence receives seepage water from soil on top of McKown ledge in greater amounts and for longer time periods than remaining cliff-face. Exposure of plant micro-habitat is approximately W30°N while rest of cliff exposure faces more westward (counter clockwise to W10°S). Other cracks in cliff have been colonized by *Adiantum capillus-veneris, Rhus toxicodendron* and *Callicarpa americana.* Dominant elements of colluvial slope woodland which shades solar radiation from west are *Quercus texana, Viburnum rufidulum, Cornus drummondii* and *R. toxicodendron.*

Specimens from McKinney Falls are believed to represent easternmost individuals of central Texas population adapted to hard limestone cliffs; nearest populations of deep-soil adapted form is 250 km eastward (Pfeiffer, op. cit.). The name *hastata* Nutt. has been applied to forms with narrow sagittate leaves which are "especially common in the south" (Correll and Johnston, *Manual of the Vascular plants of Texas*, 1970: 508). While leaf morphology agrees with above description. Ahles (J. Elisha Mitchell Sci. Soc.

75: 130, 1959) has declared *hastata* Nutt. invalid because it was proceded by *hastata* HBK, a Mexican species. Ahles (op. cit.) declared *nashii* Kearney as the basonym for *hastata* Nutt. The name *nashii* was applied to Florida specimens which possessed ". . . petiole pubescent, 1–3 mm long, standing at right angles to the intermode below . . ." (Kearney, Bull. Torr. Bot. Club 21: 482–487, 1894). However, Travis County specimens possess slightly pubescent petioles which are 3.5–13.0 mm and are not at right angles to respective internode. Further study will be required to elucidate the valid taxonomic treatment for the Central Texas population of *A. serpentaria.*

Pisonia aculeata L. Devil's claw pisonia is distributed in Mexico, West Indies. Florida, and deep southern Texas. Texas specimens have generally been highly scattered individual plants in subtropical thorn woodlands associated with resacas in Cameron and Hidalgo Counties (Correll and Johnston op. cit.; Vines, *Trees, shrubs and woody vines of the southwest*, 1960). Recently, a large stand of this scandent shrub has been located within Resaca de la Palma State Park Site in Cameron County. *P. aculeata* occupies a crescent-shaped area above a cutbank of Resaca de la Palma for a distance of 220 meters and a width of 17 meters from edge of water. Area is a sprawling thicket of growing branches over collapsed dead *Pisonia* branches and supportive trees. Dominant trees in this area which support *Pisonia* are *Pithecellobium flexicaule, Ehretia anacua, Ulmus crassifolia* and *Bumelia celastrina.* Other shrubs present include *Solanum erianthum, Randia rhagocarpa, Porlieria angustifolia* and *Amyris madrensis.* Other vines present in immediate area are *Mikania scandens* and *Smilax bona-nox.*

Largest branches of *Pisonia* are dead central trunks with DBH as large as 11.0 cm and soil-level circumference of 15.6 cm. These dead trunks may have been killed by severe freeze of 9-12 January 1962 (19°F in Brownsville) or the major drought of 1950-1957 with subsequent sucker shoots having attained DBH of up to 2.1 cm. Large dead trunks may represent growth since previous major freeze of 13 February 1899 (12°F in Brownsville). Numerous small plants are present in areas not covered by thicket of tangled vines. Soil is deep silty clay loam (Laredo Soil) developed from remnant levees of the Rio Grande River.

Voucher specimens are: *Aristolochia serpentaria, Neck, 1036* (SMU), *Pisonia aculeata, Neck, 1135, 1136* (SMU).—*Raymond W. Neck, Texas Parks and Wildlife Department, 4200 Smith School Road, Austin, TX 78744.*

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REVIEW

A JOURNAL OF TRAVELS INTO THE ARKANSAS TERRITORY DURING THE YEAR 1819 by Thomas Nuttall. Edited by Savoie Lottinville. xxviii + 361 pp. frontis. and 8 illus. Univ. Oklahoma Press, Norman. 1980. $25.00.

September 8, 1819. "We were, for several days, destitute of any kind of food, except the tails of the beaver, the flesh of this animal being now too lean and musky to be eaten." Two sentences later: "amongst several other new plants, I found a very curious *Gaura*" and five other genera. "Always aiming at the real and substantial," as Jacob Bigelow (the anonymous reviewer) remarked in 1823, this "plain, unvarnished tale" has not been available as a whole with annotations since Reuben Gold Thwaites (1905). This latest edition offers more for the naturalist because over the seventy five years, studies by Pennell, Geiser, Goodman, Beidleman, McKelvey, Graustein, and Stuckey, have enriched the text. A dark impression but readable and useful facsimile of the *Journal* was published in 1966 by Readex Imprint Corporation. The Nuttall panoramas were printed too dark and "a map of the Arkansas River" reduced as to be viewed from a satellite. Geiser published a meticulous analysis of the month-long diversionary excursion from Fort Smith to the Red River, with suggested plant identities, in 1956, that has been followed by Lottinville. This attractive edition, advantageously well indexed, is Nuttall *redivivus*.

There are pockets of curiosity: where did Nuttall know the African succulents, the genus *Stapelia*? Perhaps in the Liverpool Botanic Garden? Or later, at William Hamilton's "Woodlands"? Relying on the insubstantial Du Pratz account what were the "India Ducks" that Nuttall mentioned? When one reads the Du Pratz reference muscovy ducks come to mind. Nuttall repeats the name "Populus angulisans" for a poplar suggesting that it was not altogether a *lapsus calami*; perhaps a manuscript name which he later decided to abandon?

A few marginalia in my copy: *Catalpa cordifolia* Jaume-St Hilaire in Duhamel, *Arbustum* ed. Nov. 2 (1804) 13. pl. 5.—a book which Nuttall presumably saw at the Academy Library while he was writing the text—suggests he was distinguishing his catalpa from Walter's *C. bignonioides* which he would have known. When Nuttall cited *Schrankia horridula* (p. 180 of the original) he may have intended to transfer Michaux's *Mimosa horridula* which again, he found in a work familiar to him. *Boebera glandulosa* was misread (p. 55): the name was published by Persoon, *Synopsis*, 2 (1807) 459, and should be related to the well known "Fetid marigold" (*Dyssodia papposa* (Vent.) Hitchc.).

When queries pose the answer may be found in two overlooked commentaries: by Richard Beidleman (*Arkansas Historical Quarterly* 15 (1956) 249–259), and Ronald Stuckey, a review of Graustein's biography (*Rhodora*

70 (1968) 429–438), which included a bibliography of articles about Nuttall. In a letter quoted by Beidleman (p. 256) Nuttall wrote to his patron Zaccheus Collins from Fort Smith on May 12, 1819, mentioning the sketches included in the book, the originals of which have never been located. In the same letter Nuttall solicited support for an exploration of the western Gulf Coast that he was never able to visit. That Pursh had earlier proposed, presumably to Joseph Banks, a joint exploration into the Southwest (*Huntia* 3 (1979) 83–86) was Nuttall's well kept secret.

A portrait of Nuttall drawn by Derby, engraved by Thomson and intended by the publisher Henry Fisher of Liverpool for a London edition of the *Travels* was never issued. Jepson told the story in *Madroño* (2: frontis. 1934). The portrait has been cropped as a frontispiece here so that Nuttall's Napoleonic gesture is eliminated.

When Nuttall prefaced his *Journal* he remarked that his narrative was not addressed to those "who vaguely peruse for pastime or transitory amusement" but since 1821 there has been an appetite for Americana and Nuttall's story is a "limpid account" (Geiser) of trial and conflict, misery and triumph, stolen horses, quicksands, a skyfull of grasshoppers, bison bulls "lean and agile" the large head hid in bushy locks, galloping "like so many huge lions." *Joseph Ewan, Department of Biology, Tulane University, New Orleans, LA 70118.*

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NEW SPECIES OF *NAMA* (HYDROPHYLLACEAE) FROM THE CHIHUAHUAN DESERT REGION OF MÉXICO

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The genus *Nama* is a predominantly North American taxon, particularly well developed in the drier regions of the southwestern United States and northern México. Examination of the genus as represented in the Chihuahuan Desert and adjacent regions has revealed the presence of four previously unrecognized species, described herein, as well as the need for realignment of one described taxon.

NAMA **hitchcockii** Bacon, sp. nov.

Suffrutices erecti vel decumbentes dense hispido-strigosi et sparse glandulares; caules copiose ramosi 20–35 cm alti caulibus veteribus in dimidio inferiore saepe nudis; *folia 10–30 mm longa et 1.5 mm lata linearia valde revoluta; cymae congestae terminalaes*; pedicelli validi 1–5 mm longi; sepala 9–11 mm longa lineario-lanceolata ad apicem rotundata vel acuta; *corolla 9–11 mm longa tubularis debile infundibuliformis flava vel cremea; filamenta 6–8 mm longa* partibus liberis partes adnatas late alatas multo brevioribus; *styli 4–5 mm longi*; capsulae 4–5 mm longae; *semina irregulariter superficiebus multis brunnea alveolata.*

TYPE: MÉXICO. NUEVO LEÓN: gypsum flats and ravines in open pinelands, about 3 mi S of Galeana; perennial with cream-color flowers, 20 Jul 1958, *D. S. Correll & I. M. Johnston 19849.* (HOLOTYPE: LL).

Additional specimens seen: NUEVO LEÓN: 7 mi toward Galeana from the turnoff on the Saltillo-Matehuala highway, elevation ca 7000 ft., 8 Oct 1959, *Johnston & Graham 4211* (TEX); 6.7 mi E of San Roberto on Hwy. 60, along roadside, 21 Aug 1973, *Bacon & Dillon 1488* (TEX); 7.2 mi E of San Roberto on Hwy. to Linares, 26 Jun 1971, *Bacon 1010* (TEX); 17 mi E of San Roberto Junction and then S on dirt (mine) road for 2 mi, 24 Oct 1970, *Turner & Crutchfield 6325* (TEX); mesa, altitude 5400 feet, municipality Galeana, 29 Jul 1939 *Chase 7637* (MO, GH); 1 mi N of Hwy. 60 on road to Galeana, 26 Jun 1971; *Bacon 1011* (TEX); 0.9 mi N of Nuevo León Hwy. 60, ca 3 mi S of Galeana, 23 Sep 1973, *Atwood & Reveal 5983* (UC, left hand member on sheet); 2.5 mi S of Pueblo Galeana near jct. of road to Linares, 6 Aug 1965, *Irving 147* (TEX), *Stuessy 265* (TEX); along Mexican Hwy. 68, 37.7 mi north of Dr. Arroyo, 4.3 mi N of jct. 68 and Aramberri road, 24 Sep 1973, *Atwood & Reveal 5992* (UC).

Nama hitchcockii is unique among namas in its corolla color. All populations I have visited in the field exhibited yellow corollas; most of the specimens I examined also had recorded a yellow flower color. The type specimen, however, refers to a "cream-color" flower and the *Turner and*

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Crutchfield collection notes an "off-white" flower color. In both instances, I interpret the references as indicative of a yellowish cast to the flowers.

Label data and personal observations indicate *N. hitchcockii* is a gypsophile; whether obligate or facultative requires further study; but I favor the latter. It does appear, however, that the species prefers relatively barren, eroded areas essentially free of other growth, at least in the Galeana region.

The species is related to *N. johnstonii C. L. Hitchc.* (as discussed following *N. constancei*). Indeed, I previously determined the chromosome number for *N. hitchcockii* but reported the counts as *N. johnstonii* (Bacon, 1974), although noting the distinctive features of the specimens from which the number was determined.

The taxon is named in honor of *C. Leo Hitchcock*, to whom all students of *Nama*, present and future, are indebted for his excellent, early monograph of the genus.

NAMA **constancei** Bacon, sp. nov.

Suffrutices adscendentes vel erecti 14–30 cm alti hispido-strigosi sparse glandulares; *folia 10–45 mm longa et 1.5 mm lata sessiles aliquantum carnoso-incrassata, plana vel rarius debile revoluta; flores solitarii vel fasciculati 2–3-flori pro parte majore in ramis axillaribus brevibus floriferis in 0.7 superis plantae portati*; pedicelli nulli vel 8 mm longi atque crassi; sepala 8–12 mm longa lineario-lanceolata subulata acuta vel rotundata; *corolla 10–15 mm longa tubulo-salverformes roseolata rarius (demum?) alba; filamenta 7–11 mm* longa partibus liberis partes adnatas prominente alatas multo brevioribus; *styli 5–8 mm longi*; capsula 3–5 mm longa; *semina ovoidea brunnea reticulata et saepe excavata.*

TYPE: MÉXICO. COAHUILA: ca 62 (air) mi WSW of Cuatro Cienegas, in gypsum outcropping on northside of Sierra de los Organos, ca 5 mi SW of Cuesta del Gallo, near 26° 44′ N lat, 108° 03′ W long, 4400 ft; fleshy leaved perennial, flower tube white, lobes pinkish; with *Acacia, Fouquieria shrevei, Grusonia, Coldenia, Euphorbia, Dasylirion*, etc., 8 Aug 1973, *James Henrickson 12113* (HOLOTYPE: TEX).

Additional specimens seen: MÉXICO. COAHUILA: south part of Sierra de los Organos, approach 9.5 km E of Puerto del Gallo, then by foot S into large canyon, 1200-2100 m., 9 Aug 1973, *Johnston et al. 12112* (LL); 12 km NE of Las Margaritas on the eastern most ridge of the Sierra de las Margaritas, 26° 33′ 30″ N lat., 102° 51′ 30° W long., 1300-1400 m, 24 Sep 1972, *F. Chiang, Wendt & Johnston 9508b* (LL); ca 62 (air) mi SW of Cuatro Cienegas, in long winding limestone canyon in northside of Sierra de Organos, 26° 41′ N lat., 103° 03′ W long., 5300 ft, 8 Aug 1973, *Henrickson 12157* (TEX); ca 32 (air) mi NE of Tlahualilo, in the NW portion of the Sierra de las Delicias, in the first canyon S of the Puerto de las Sardines, 26° 22′ N lat., 103° 06′ W long., 4400 ft, 9 Aug 1973, *Henrickson 12211* (TEX); ca 18 (air) mi NE of Tlahualilo, in the Sierra de Tlahualilo, ca 9 (air) mi N of Los Charcos de Risa, 26° 17′ N lat., 103° 14′ W long., 4500 ft, 29 Sep 1973, *Henrickson 13714* (TEX); ca 1 km W of Las Delicias at and near spring, 26° 14′ N lat., 102° 49′ 30″ W long, 1000-1300 m, 24 Mar 1973, *Johnston, Wendt & Chiang 10385e* (LL), 27 Aug 1971, *Henrickson 6036* (TEX), 12 Aug 1973, *Henrickson 12248* (TEX); Cañon del Agua Grande, in the Sierra del Sobaco, a few km W of Las Delicias, 2 Oct 1942, *Stewart 2814* (GH); 1 km SE of Rancho del Coyote, 25 Sep 1942, *Stewart 2752* (GH), *2754* (GH).

Nama constancei is a marked gypsophile, for gypsum is noted as the substrate for all cited collections save one. The exceptional specimen, *Henrickson 13714* (TEX), is atypical in other ways as well and is included here with reluctance and uncertainty. The collection is reminiscent of *N. johnstonii* in some respects but lacks the pubescence and flower arrangement of that taxon; indeed, it resembles *N. hitchcockii* in those aspects. However, it lacks the overall robustness and woodiness typical of *N. hitchcockii* and flower color is recorded as "pink-white". The collection was taken in the Sierra de Tlahualilo, which is west of the relatively tight group of mountain ranges from which the remaining collections of *N. constancei* were taken. The collection may represent yet another underscribed taxon.

The species is named in honor of Lincoln Constance, long-time student of the Hydrophyllaceae.

Among the Chihuahuan Desert namas there occurs a distinctive, presumably interrelated group of perennial, essentially linear leaved species, including *N. flavescens* Brandeg., *N. canescens* C. L. Hitchc., *N. stenophyllum* Gray ex Hemsl., *N. carnosum* (Woot.) C. L. Hitchc. and *N. johnstonii* C. L. Hitchc. With one exception the species are edaphically similar in that they exhibit a marked predilection for, if not an obligate requirement for, gypseous soils. Generally allopatric, these species occupy gypseous flats and outcroppings of lower mountain slopes from northern San Luis Pososí to southeastern New Mexico. *Nama johnstonii*, the exceptional taxon, is a reportedly limestone endemic known only from cliffs and outcroppings in the Sierra de Jimulco, Sierra de Parras and Sierra de la Fragua in southwestern Coahuila.

Nama hitchcockii and *N. constancei* are to be included in this linear leaved grouping and are to be positioned near *N. johnstonii*. All three species are similar in habit, being woodier and shrubbier than other species in the group. Both *N. constancei* and *N. hitchockii* differ from *N. johnstonii* in being gypsophiles, although *N. hitchcockii* may prove to be facultatively so. Distributionally, *N. constancei* is found in the same general area occupied by *N. johnstonii*, but at lower altitudes; *N. hitchcockii* is disjunct from the former two (closest known localities about 100 km. to the east), occurring in the more montane region from Galeana, Nuevo León south to near Aramberri, Nuevo León.

While firm relationships among these three species have yet to be defined, certain features, particularly those of seed coat morphology and flower arrangement, hint at a more intimate relationship between *N. hitchcockii* and *N. johnstonii*, with *N. constancei* their more distant kin. Furthermore, seed features of the former pair of species suggest that they are related to *N. stenophyllum* and *N. canescens* while seeds of *N. constancei* are more reminiscent of *N. carnosum*. All things considered, *N. hitchcockii, N. constancei* and *N. johnstonii* may prove to be the basal elements of the linear leaved perennials.

NAMA **turneri** Bacon, sp. nov.

Herbae perennes humiles ad basem ligneae, caules annui hirtello-hirsuto-hispidi glandularesque 8–15 cm longi; *folia 5–17 mm longa 1.5–6 mm lata oblanceolato-spatulata, ad apicem obtusa ad basem attenuata plana vel debile revoluta; flores solitarii prope caules vel inflorescentiae laxae pauciflorae terminales*; pedicelli saepe tenues 1–2 mm longi; sepala 4–7 mm longa, lineario-lanceolata vel lineario-oblanceolata ad apicem acuta; *corolla 6–8 mm longa late hypocrateriformes lavandulo-purpurea vel alba; filamenta 2–3.5 mm longa* partibus liberis partes adnatas anguste alatas brevioribus vel longioribus; *styli 1.5–2.5 mm longi*; capsula 3–4 mm longa; *semina ovoideo-fusiformes flava reticulata vadose excavata.*

TYPE: MÉXICO. SAN LUIS POTOSÍ: 6.5 mi E of Hwy. 57 on the road to Cerritos, along roadside near small group of houses, rocky-clay soil; caespitose perennial with large tap root, corolla blue-purple, 25 Jun 1971, *Bacon 991* (HOLOTYPE: TEX; ISOTYPES: to be distributed).

Additional specimens seen: MÉXICO. NUEVO LEÓN: 37 mi N of Matehuala on Hwy. 57 (Km 64), 26 Jun 1971, *Bacon 1006* (TEX); 7 mi N of San Roberto on Hwy. 57, 26 Jun 1971, *Bacon 1015* (TEX). SAN LUIS POTOSÍ: 0.2 mi W of Hwy. 57 (Km 64), 26 Jun 1971, *Bacon 1006* (TEX); 7 mi N of San Roberto N of Hwy. 57 on road to Cedral, 26 Jun 1971, *Bacon 1003* (TEX).

Yet another marked gypsophile, *N. turneri* is to be associated with other namas having yellow, ovoid-fusiform seeds, particularly *N. hispidum* Gray and *N. stevensii C. L. Hitchc.* var. *gypsicola* (I. M. Johnst.) Bacon. While *N. turneri* shares a similar edaphic preference and habit with var. *gypsicola*, it differs from that taxon in its decidedly perennial habit and its broader, apically obtuse leaves. Although lacking the prostrate habit and perennial duration of *N. turneri*, it is probable that *N. hispidum* will prove to be the closest relative of this species.

The taxon is named to honor B. L. Turner, able and ardent student of the gypseous flora of North America, who first introduced me to *Nama* and the delights of gypsum endemism.

NAMA **rzedowskii** Bacon, sp. nov.

Herbae annuae vel debile perennes sparse vel modice hispidulae glanduliferaeque; caules tenues adscendentes 3–6 cm longi; *folia opposita 5–20 mm longa 2–4 mm lata oblanceolato-spatulata ad apicem rotunda ad basem attenuato-subpetiolata plana vel debile revoluta; flores solitarii vel binati prope caules*; pedicelli 2–4 mm longi; sepala 2.5–4.5 mm longa ad 1 mm lata lanceolata vel oblanceolata ad apicem acuta; corolla 4–4.5 mm long tubulares purpurea; *filamenta 2–2.5 mm longa* partibus liberis partes adnatas longioribus; *styli ad 1 mm longi*; capsulae 2.5–3 mm longae; *semina irregulariter ovoidea vel debile multilaterales brunnea reticulata.*

TYPE: MÉXICO. SAN LUIS POTOSÍ: 9 km E of Rioverde, on the highway to Rayón, alluvial plains with halophytic grasses and *Prosopis*, 1000 m, plant annual, flowers light purple, 16 Sep 1967, *Rzedowski 24777* (HOLOTYPE: UC, lower left hand member on sheet).

The opposite leaves of this taxon point to a relationship with *N. serpylloides* Gray ex Hemsl., the two species being the only namas with such a phyllotaxy. Moreover, the small capsules with short styles as well as minor features of the seeds of *N. rzedowskii* are reminiscent of *N.*

serpylloides. Nevertheless, the two species are quite distinct. *Nama rzedowskii* is a diminutive, purple flowered annual, possibly a weak perennial, and lacks the dense, often velvety pubescence of its strongly perennial, pink flowered relative. The relationship may prove to be more distant than the beguiling leaf arrangement would suggest.

The species is named for Dr. Jerzy Rzedowski, who discovered the only known population of the species.

NAMA STEVENSII C. L. Hitchc. var. **gypsicola** (I. M. Johnst.) Bacon comb. nov.—Based on *Nama hispidum* Gray var. *gypsicola* I. M. Johnst. J. Arnold Arbor. 22: 162. 1941.

After additional study, I here follow up my previous suggestion (Bacon 1974) and align var. *gypsicola* with *N. stevensii.*

I thank Dr. Marshall C. Johnston for providing the latin diagnosis and Dr. Lincoln Constance for calling the Rzedowski collection to my attention.

REFERENCES

BACON, J. D. 1974. Chromosome numbers and taxonomic notes in the genus *Nama* (Hydrophyllaceae). Brittonia 26: 101–105.

STACHYS (LABIATAE) IN SOUTHEASTERN UNITED STATES

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ABSTRACT

The genus *Stachys* is well represented in North America. Within southeastern United States, seven species occur in a variety of habitats, some taxa very localized, some quite widespread. Field and herbarium study reveal the generally high variability among these species, thus warranting the characterization of *Stachys* as a "difficult" genus taxonomically. Future studies on the cytology and breeding systems at work within *Stachys* will be necessary for an understanding of these species' interrelationships.

The essentially cosmopolitan genus *Stachys* consists of about 200 species in the subfamily Stachydoideae, making it one of the larger genera of Labiatae. Various subgeneric dispositions of *Stachys* have been presented; Bentham (1832-1836) divided it into nine sections. Taxonomically, the genus is noted for the frequent occurrence of related taxa forming "species groups" (ten such groups were proposed by Epling 1934), these often intergrading and creating confusion. *Stachys* occurs extensively throughout North America. The eastern areas of Canada and the United States are especially rich in species, due to conjunction of Old World and New World taxa. As Epling (1934) stated, it is then not surprising that *Stachys* develops "a bewildering complex of cross-relationships" in eastern North America. Further, European and Asian counterparts to various American species occur in this region, adding to the confusion.

Seven native or definitely naturalized species are recognized in southeastern United States (the geographic area bounded by and including Louisiana, Arkansas, Tennessee, Kentucky, West Virginia, Maryland, and Delaware), where the genus occurs widely and in a number of habitats. Several taxa are endemic. Some introductions appear sporadically as ephemeral weeds or escaped cultivated species. Economic uses will be mentioned in the specific treatments.

Historical Account. The name *Stachys* is derived from the Greek . . . . . meaning a spike of wheat (some field manuals and popular accounts describe the inflorescence as a "spike," which is technically incorrect). Pliny's use of the word in his *Historia Naturalis* makes reference to a wild plant, although his description does not pin down a particular genus. Linnaeus (1753) retained Tournefort's original usage of this generic name (Tournefort 1700).

SIDA 9(2): 104–123. 1981.

Bentham's *Genera et Species Labiatarum* (1832-1836) remains to date the only world-wide monograph for the Labiatae, although Briquet (1897) provided an extensive treatment in *Die Natürlichen Pflanzenfamilien*. Briquet variously rearranged Bentham's earlier sectional placements for *Stachys*; five sections were recognized, with all native southeastern United States species assigned to *Eustachys* (= section *Stachys*).

Epling's (1934) treatment of *Stachys* in North and South America remains our only monographic source available for the genus. Considering the American species highly complex, Epling wrote, "Since the genus forms a network of interrelated species it is difficult to cast them into even an artificial scheme which is satisfactory" (p. 1). He further stated that continued research on Eurasian species would probably effect changes in his ten artificial and admittedly "temporary" species-groups. Epling also pointed out the possibility of vicariance within the genus, with distinctly European or Asian taxa (including *S. silvatica* and *S. chinensis*) forming counterparts with North American forms (*S. nuttallii* and *S. hyssopifolia*).

Elliott (1824) recognized four species from the Carolinas and Georgia, all (in his treatment) restricted to the Coastal Plain. In this early work, it is recognized that obvious problems occur in separating taxa; for example, Elliott questioned the status of Michaux's *S. aspera*.

Gray (1886) attempted the first infraspecific division of *S. hyssopifolia* Michx., with the formation of his variety *ambigua*. At this point, some indication of the confusion in the status of *S. tenuifolia* Willd. and its varieties can be seen, all of which were merged under *S. aspera* Michx.

Small (1933) re-emphasized infrageneric treatment in his handling of the genus. The five sections he devised are somewhat artificial in set-up, and the key in his *Manual* is rather trying. Generally, though, his treatment of the southeastern species is in agreement with earlier workers in noting the importance of character states such as calyx-lobe length and leaf-base shape in delimiting taxa.

Britton and Brown (1947) listed 13 species occurring in the southeast. The approach here was characteristically toward splitting taxa, with *S. aspera* Michx. and *S. ambigua* (A. Gray) Britt. (not *S. ambigua* J. Smith) separated as distinct taxa. All taxa with affinities to *S. hyssopifolia* were given specific status. The rare and unestablished *S. arvensis* L. and *S. annua* L. were also considered.

Fernald's (1950) revision of *Gray's manual of botany* offers a critical analysis of *S. palustris* and *S. tenuifolia*, each divided into numerous varieties. In total, he recognized 11 species, six of which are native to the area.

Within the Carolinas, Radford et al. (1968) recognized considerable confusion among the montane spices. My research has, in part, supported the view in their treatment that several Blue Ridge Mountain taxa may represent a single polymorphic species. Knowledge of the systematics of this genus in the southeast will definitely be augmented by future cytotaxo-

nomic studies; the karyology of *Stachys* is poorly known in this region, and its breeding behavior even less well known.

MATERIALS AND METHODS

Results and conclusions are based largely on field observations and collections made in the southeast and on studies of over 2000 herbarium specimens loaned by the following herbaria or seen during visits to them (abbreviations as in Index Herbariorum, ed. 3): AUA, CHRB, CLEMS, DUKE, F, FLAS, FSU, GA, GEO, GH, HNH, KY, LAF, MAINE, MARY, MICH, MISS, NCSC, NCU, NLU, NY, P, PENN, PH, QFA, QK, QUE, TENN, TRT, UARK, UCLA, UNA, UNCC, US, USCH, VPI, VT, and WVA. In addition, photographs and/or xeroxes of type collections were supplied by F, HAL, K, MO, NY, and PH.

Study of herbarium specimens has allowed the compilation of measurements for many character states useful in delimiting taxa. Involved in circumscribing each taxon were measurements of plant height, leaf width and length and petiole length for upper and lower leaves, inflorescence length, number of verticils per inflorescence, number of flowers per verticil, calyx-tube length, calyx-lobe length, corolla length, and mericarp dimensions. As expected, certain of these measurements are more important than others. Descriptions of each taxon have been produced. County distributions have been recorded from information on herbarium labels as well as from field collections; each dot on the maps represents the occurrence of at least a single population in a given county.

Field observations and collections were made of living *Stachys* populations from 1974 to 1979. Duplicates of collections have been, or are being, distributed to herbaria from which loans were obtained. A list of specimens examined is not presented in this paper; such a list will be supplied upon request.

SYSTEMATIC TREATMENT

STACHYS [Tourn.] L., Syst. ed. I, 1735, Gen. ed. I, 171, 1737. Gen. Pl. ed. V, 253, 1754.

Generic synonomy as in *Index Kewensis*:
Betonica Tourn. ex L., Syst. ed. I, 1735; Gen. ed. I, 171, 1737.
Zietenia Gled., Syst. 185, 1764.
Trixago Hall., Hist. Stirp. Helv. 101, 1768; Moench, Meth. 398, 1794.
Bonamya Neck., Elem. I, 316, 1790.
Galeopsis Moench, Meth. 397, 1794.
Tetrahitum Hoffmgg. & Link, Fl. Port. I, 105, 1809.
Eriostomum Hoffmgg. & Link, Fl. Port. I, 105, 1809.
Eriostachys Reichb. ex Steud., Nom. ed. II, 588, 1840.
Ambleia Spach, Hist. Veg. Phan. 9, 166, 1840.
Olisia Spach, Hist. Veg. Phan. 9, 166, 1840.
Trixella Fourr. in Ann. Soc. Linn. Lyon, N.S. 17:135, 1869.
Ortostachys Fourr. in Ann. Soc. Linn. Lyon, N.S. 17:136, 1869.

Aspasia E. Mey. ex Pfeiff., Nom. I, 298, 1873.
Stechys Boiss., Fl. Orient. IV, 694, 1879. Err. typog.

Annual, or usually perennial herbs, the underground parts often prominently tuberous-thickened. Stems quadrangular, erect or sometimes sprawling, generally not more than 1 meter tall, glabrous to strongly hispid. Leaves opposite, decussate, the petioles absent to well-developed, the blades linear to broadly ovate. Inflorescence of verticillate cymules, the lowest verticil often with only 2 flowers, otherwise each cymule 3 or more flowered, each verticil with 2 foliose bracts. Flowers perfect, short-pedicellate, subtended by 2 bracteoles. Calyx regular, 5-lobed, the lobes usually awned. Corolla bilabiate, the upper lip galeate, the lower lip 3-lobed. Stamens 4, didynamous, barely exserted. Ovary of 2 carpels, superior, bearing 4 ovules, the style gynobasic and exserted, the stigma bifid. Mericarps 4 per ovary, or fewer by abortion.

Type species: *Stachys sylvatica* L:

KEY TO SOUTHEASTERN STACHYS

1. Leaves sessile or short-petioled, the petioles (if present) less than 1/6 the length of the longest blades ..... 2.
   2. Plants slender, glabrous to hispid, lower stem sides not glandular, or rarely so; leaves linear to narrowly elliptic, usually not more than 1 cm wide ..... 1. *S. hyssopifolia*
      3. Plants glabrous to glabrate; leaves essentially entire, or with some small teeth towards the apex 4
         4. Leaves linear, to 10 times as long as broad ..... 1a. var. *hyssopifolia*
         4. Leaves elliptic, to 4 times as long as broad ..... 1b. var. *lythroides*
      3. Plants glabrous to glabrate; leaves essentially entire, or with some small
   2. Plants robust, pubescent, the upper stem sides mostly glandular; leaves ovate-lanceolate to lanceolate, not less than 1 cm broad ..... 2. *S. eplingii*
1. Leaves with distinct petioles 1/4 the length of longest blades, or longer 5
   5. Leaves 6–11 cm long; stem angles hispid to merely roughened 6
      6. Upper stem sides glabrous; leaf bases truncate to rounded, blades elliptic to lanceolate ..... 3. *S. tenuifolia*
         7. Calyx lobes about as long as the tube; stem angles glabrous to bristly . 8
            8. Leaves elliptic-ovate, broadest near middle ..... 3a. var. *tenuifolia*
            8. Leaves lanceolate, tapering from a mostly truncate base ..... 3b. var. *perlonga*
         7. Calyx lobes shorter than tube; stem angles glabrous to roughened, never bristly ..... 3c. var. *latidens*
      6. Upper stem sides lightly pubescent; leaf bases mostly cordate, the blades ovate 9
         9. Inflorescence lax, sometimes nodding slightly; bracts rapidly reduced upwards from first fertile node ..... 4. *S. nuttallii*
         9. Inflorescence stout; bracts gradually reduced upwards ..... 5. *S. clingmanii*
   5. Leaves shorter, usually no longer than 6 cm; stems glabrous to lightly villous, occasionally hirsute 10
      10. Perennial; calyx tube 6–7 mm long; corolla 10–13 mm long ..... 6. *S. floridana*
      10. Annual; calyx tube 2–2.5 mm long; corolla 5 mm long ..... 7. *S. crenata*

1. STACHYS HYSSOPIFOLIA Michx., Fl. Bor. Amer. 2:4. 1803.

TYPE: U.S.A. Probably SOUTH CAROLINA: without location, without date, *Michaux s.n.* (ISOTYPE: P!; Photograph of isotype!).

Perennial from tuberous or thickened roots. Aerial stems sprawling or erect; flowering stems 35–82 cm tall, very often highly branched from the lower nodes; stems completely glabrous to definitely hispid along the angles, with the nodes lightly bearded. Leaves sessile or short-petioled, 2–6 cm long, 0.2–3 cm wide, glabrous, margins entire or very shallowly toothed mostly near the apex, sometimes revolute; leaf bases rounded to acute to narrowly cuneate. Inflorescence of 5–15 verticils, each 6 (or fewer)-flowered, each with a pair of sessile bracts to 6 mm long. Calyx lobes about equal to tube in length, usually widely divergent in fruit, each with a stiff glabrous awn; lobe margins glabrous to ciliate, occasionally serrated. Corolla 10–13 mm long. Mericarps 1.5–2 mm long, smooth to finely reticulate.

1a. STACHYS HYSSOPIFOLIA Michx. var. HYSSOPIFOLIA

S. atlantica Britt., Man. Fl. N. U. S. 792. 1901.
TYPE: U.S.A. NEW YORK: Long Island, without date, *Clute 277* (HOLOTYPE: NY!).

Flowering stems 18–35 cm tall, nearly totally glabrous, or the angles with a few scattered retrorse trichomes. Leaves lanceolate or linear, the upper surface glabrous or occasionally lightly hispid, the lower surface glabrous; leaf margins entire. Calyx usually glabrous, or with a few jointed hairs on the upper 3 lobes.

Sandy lake edges, sinks, and savannahs on the Coastal Plain from Georgia to Delaware (fig. 1). Outside of the southeast, this variety is known from Pennsylvania north to Massachusetts and from the southern reaches of Lake Michigan, including sites in Illinois, Indiana, and Michigan.

Elliott's (1824) treatment of *S. hyssopifolia* is probably concerned with this variety. He described it as growing "like all the other species of the genus, in wet pine-barrens, most common in the middle country of Carolina and Georgia." While wet pine-barrens seem a likely habitat for this plant, it is hardly true for all the species of genus, even those within the Carolinas.

Britton's *S. atlantica* represents a short-leaved form; Britton himself suggested it as a "wet-ground race" of the typical variety.

The obvious disjunct distribution within this variety is of interest. The southeastern plants are essentially indistinguishable from those in the Lake Michigan area. Apparently, the variety is not known in the intervening areas between the southeast and the upper midwest. Similarly, plants from the southern and northern reaches of the variety on the Atlantic coast show no distinction morphologically. Populations from Barnstable County, Massachusetts, and from Aiken County, South Carolina, that I have seen are essential alike, although it appears that the Massachusetts plants might have a weedy

tendency, being present in places around buildings and in disturbed ground.

1b. STACHYS HYSSOPIFOLIA Michx. var. LYTHROIDES (Small) J. Nelson, Phytologia 46:94. 1980.

Basionym: *S. lythroides* Small, Fl. S. E. U. S. 1031. 1903.
TYPE: U.S.A. FLORIDA: near Tallahassee, *Berg s.n.* (HOLOTYPE: NY!).

Flowering stems 60–80 cm tall, very often branched near the base, and often sprawling; stem sides glabrous, the angles somewhat rough-hispid, more so near the apex. Leaf blades elliptic to narrowly rhomboid, the apices rounded to acute; margins entire or sometimes obscurely toother near apex, both surfaces glabrous. Calyx glabrous, or with numerous jointed trichomes on upper half of the tube.

Known only from Leon County, Florida, in a few scattered locations (fig. 1); this variety is considered a threatened plant in Florida. The two populations I have seen occur in dissimilar habitats. The first, and larger, population is found in abundance on about 3 acres of cut-over, drained bottomland, receiving much sun. The second, smaller, population is entirely within a forested area, where there is much more shade. Both sites have standing water frequently throughout the year.

1c. STACHYS HYSSOPIFOLIA Michx. var. AMBIGUA A. Gray, Syn. Fl. 2:387. 1878.

TYPE: U.S.A. MISSOURI: near St. Louis, without date, *Engelmann s.n.* (HOLOTYPE: GH!).
S. aspera Michx., Fl. Bor. Am. 2:5. 1803.
TYPE: U.S.A. Probably SOUTH CAROLINA: without date, *Michaux s.n.* (ISOTYPE: P!; Photograph of isotype!).
S. ambigua (A. Gray) Britt., Mem. Torr. Bot. Club 5:288. 1894. Not *S. ambigua* J. Smith, Engl. Bot. 30: pl. 2089. 1810.
S. grayana House, N. Y. State Mus. Bull. 293:60 1921.

Flowering stems 33–75 cm tall, erect, the angles copiously bristly-hispid, or occasionally glabrate, the sides generally glabrous. Leaves lanceolate to broadly linear, or long-triangular, the upper surface hirsute or glabrous, the lower surface generally glabrous or with scattered trichomes, the margins shallowly serrate. Calyx-lobe margins often densely ciliate.

Southeastern Coastal Plain from Georgia to southern Virginia, extending northward to Pennsylvania; also in Missouri, Iowa, and Illinois (fig. 1). Moist or wet sandy soils of savannahs and open marshes.

This variety is almost always easily separable from the typical variety. Occasional intermediates are seen, in which plant stature seems more that of var. *ambigua*, but with pubescence of stem and calyx that of var. *hyssopifolia*. As does var. *hyssopifolia*, var. *ambigua* shows a discontinuous range, occurring in the southeast as well as some midwestern states.

Nomenclatural problems have arisen involving the placement of this taxon. *Stachys aspera* Michx. has apparently been used as a "catch-all" bi-

nominal for any hispid *Stachys*; Michaux's description indeed suggests a number of forms of *Stachys*. Michaux's specimen is clearly assignable to this variety. Misidentifications of this variety and unclear conceptions of it have no doubt arisen from its seemingly magic ability to "pass into" other related species, as stated by Epling, such as *S. tenuifolia* and *S. palustris*. Britton's *S. ambigua* is rejected due to the earlier publication of the epithet by J. Smith, who was describing a European species, likely of hybrid origin (Wilcox and Jones 1974).

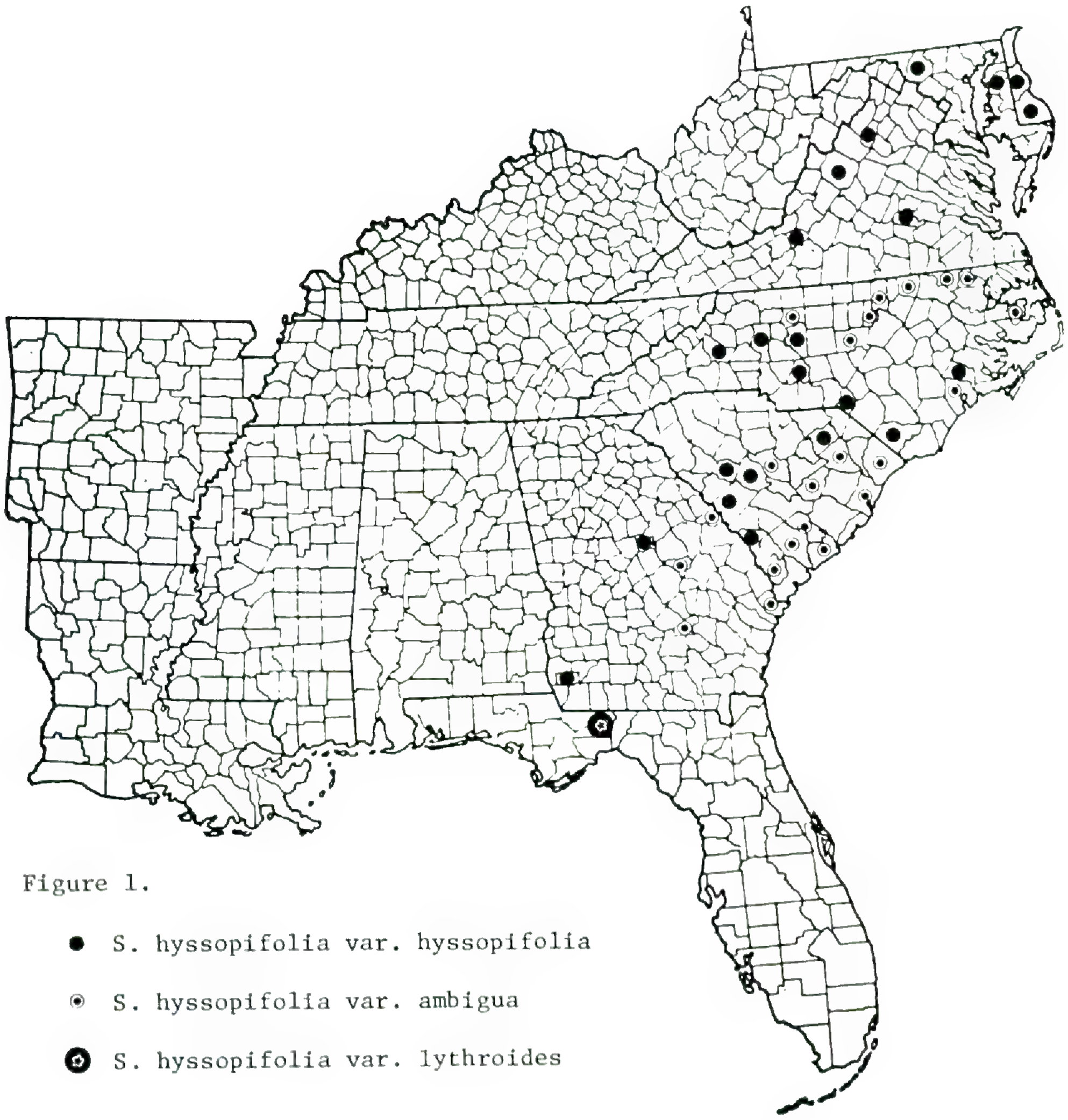

Figure 1. Documented distribution of *Stachys hyssopifolia*.

2. STACHYS EPLINGII J. Nelson, Brittonia 31:491–494. 1979.

TYPE: U.S.A. VIRGINIA: Bull Run Mountains, 29 Jun 1941, *Allard 8985* (HOLOTYPE: NY!; ISOTYPES: F! GH! VPI!).

Perennial. Flowering stems 8–15 cm cm tall, erect, unbranched or branched at the base; lower stem sides generally glabrous to pusticulate with crusty, swollen hairs, the upper stem sides glandular-pubescent to hispid; stem angles often reddish, usually hispid with jointed, retrorse trichomes; nodes lightly bearded. Leaves 7–10 cm long, about 3.5 cm wide, dark green, short-petioled or sessile, with a rank odor when crushed; blades ovate to elliptic, apex acuminate, margins finely serrulate to crenate; leaf base rounded to slightly cordate; upper leaf surface canescent to scabrous, lower surface usually glandular-pubescent, the veins bristly. Inflorescence of 8 (or more)-flowered verticils, each with a pair of foliose bracts. Calyx 3.5–4.5 mm long, the deltoid lobes 0.8–2 mm long, often ciliate, and short awned; calyx surface sometimes reddish, mostly glandular or hispid. Corolla white with purple dots. Mericarps 1.7–2 mm long, reticulate to irregularly bumpy.

Mountain forests, bogs, slopes, and meadows, primarily of the Blue Ridge Mountains from West Virginia to western North Carolina. Also reported from the District of Columbia (fig. 2). A large-leafed variety seems restricted to the Ozark Mountains.

Epling (1934) treated this species as *S. nuttallii*, a misapplied name (see Nelson and Fairey 1979). In Epling's treatment, the occurrence of three forms of this species was discussed. Such a designation of three forms seems unwieldy: the characters of the indumentum, by which he based the divisions, are probably effects of age and/or ecology rather than inherited features. This is largely true for considerations of other taxa as well.

3. STACHYS TENUIFOLIA Willd., Sp. Pl. 3:100. 1800.

TYPE: U.S.A. PENNSYLVANIA (according to Epling, 1934, but not so indicated on herbarium label): *Muhlenburg (?) s.n.*, without date (Probable HOLOTYPE: B; Microfiche!; Photograph!).

Perennial from thickened rhizomes and tubers. Aerial stems 60–80 cm tall at flowering, these often much branched from the base or the upper nodes; stem sides glabrous, the angles variously roughened, bristly-hispid, or smooth. Leaves variable in size, reduced upward, 5–10 cm long, 1–3 cm wide, the petioles of variable length, but usually about 1/4 the length of the lowest leaves; leaf blades elliptic, elliptic-ovate, to lanceolate, the apex acuminate to long-tapered, the base cuneate, rounded, or truncate, with margins generally coarsely toothed, glabrous to nearly ciliate, with various surface pubescence. Inflorescence an interrupted raceme (or often branched at the uppermost sterile node, forming three "racemes"), with 9–12 pairs of axillary cymules, these usually 6-flowered; bracts foliose, glabrous to hispid, reduced apically. Calyx campanulate, short-pedicelled, the tube 3–4

mm long, the deltoid, acuminate, or spinulose lobes 2–3 mm long, often divergent in fruit, glabrous to hispid. Corolla 1–1.2 cm long, 5–6 mm long, white to light pink with purple spots, generally glabrous, or with the outer surface lightly canescent. Mericarps 1.5–2 mm long, 1.5 mm wide, depressed-obovoid, dark brown, usually reticulate.

3a. STACHYS TENUIFOLIA Willd. var. TENUIFOLIA

S. hispida Pursh, Fl. Am. Sept. 2:407. 1814.
TYPE: *Clayton s.n.* (HOLOTYPE: BM).

S. tenuifolia Pall. in Link, Enum. Hort. Berol. 2:109. 1822.
TYPE: CRIMEA, without date, *Pallas s.n.* (HOLOTYPE: HAL; Photograph of holotype!).

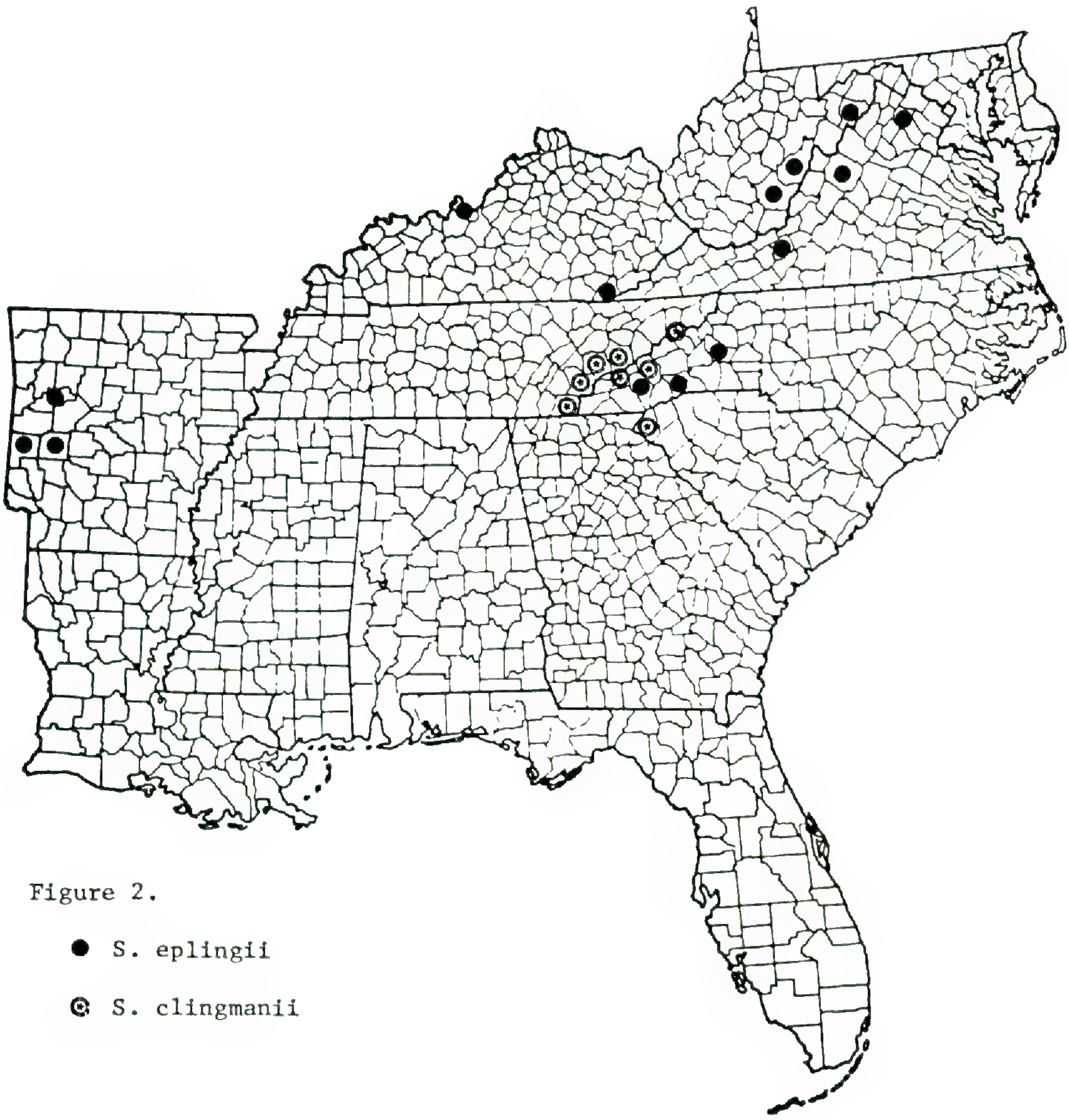

Figure 2. Documented distribution of *Stachys eplingii* and *Stachys clingmanii*.

S. glabra Riddell, Suppl. Cat. Ohio Pl. 16. 1836.
TYPE: U.S.A. OHIO: Worthington, *Riddell s.n.* (HOLOTYPE: US!).
S. palustris L. var. *glabra* (Riddell) A. Gray, Man. Bot. N. States and Can. 317. 1856. Ed. 2.
S. palustris L. var. aspera (Michx.) A. Gray, Man. Bot. N. States and Can. 317. 1856. Ed. 2.
S. aspera Michx. var. *glabra* A. Gray, Syn. Fl. 2:387. 1878.
S. cincinnatensis Ktze., Rev. Gen. 2:531. 1891.
TYPE: U.S.A. OHIO: near Cincinnati, *Kuntze s.n.* (HOLOTYPE: NY!).
S tenuifolia Willd. var. *aspera* (Michx.) Fern., Rhodora 10:85. 1908.
S. tenuifolia Willd. var. *hispida* (Pursh) Fern., Rhodora 45:469. 1943.
S. tenuifolia Willd. var. *platyphylla* Fern., Rhodora 45:468. 1943.
TYPE: U.S.A. VERMONT: *Williams s.n.* (HOLOTYPE: GH!).
S. palustris L. var. *hispida* (Pursh) Boivin, Phytologia 22:381. 1972.

Flowering stems sparingly to highly branched, the angles glabrous to markedly hirsute. Leaves 7–8 cm long, blades variable, mostly elliptic, the bases rounded or very slightly cordate, the apex acute to acuminate, both surfaces glabrous to hispid, or on the lower surface pubescence on the veins only. Calyx tube about equalling the lobes.

Widely distributed in the southeast except for Florida and most of Georgia and Alabama, extending north to New York and west to Minnesota; Epling reported (1934) its occurrence in Kansas (fig. 3). A variety of habitats, including bottomlands, thickets, shores, and roadsides.

Morphological conceptions of this variety have varied widely. To be sure, within the genus in the southeast, the highest degree of plasticity seems to occur in their variety of *S. tenuifolia.* The typical variety is considered "classically" to be nearly glabrous, with thin, long-petioled leaves, and with calyx lobes as long as the calyx tube. In the southeast, I have seen specimens referable to this variety that contradict one, two, or all three of these character states.

Mostly on the basis of pubescence, Pursh separated *S. hispida* as a species exhibiting *tenuifolia*-like characters but with a high degree of pubescence, especially along the stem-angles, and with short-petioled leaves. Epling's (1934) idea of the variety was little short of amazing, in which *S. hispida* Pursh was "derived from *S. ambigua* Smith, probably after intermixture with *S. hyssopifolia.*" Thus, his suggestion was that *S. hyssopifolia* acted as a parent with a sterile European hybrid, giving rise to another hybrid with *tenuifolia* affinities.

Fernald (1943), however, considered *S. tenuifolia* and *S. hispida* as "the two extremes of a rather polymorphous species," segregating *S. hispida* as a variety of *S. tenuifolia.* Quantitative determinations concerning the status of *S. hispida* relative to *S. tenuifolia* in Ohio indicate that Fernald's treatment is at least reasonable; a continuum of character states between the glabrous and hispid forms does exist, suggesting one large species (Cooperrider and Sabo 1969).

In my study, specimens recognizable as var. *hispida* (Pursh) Fern. were

separated, for convenience, from those of the typical variety. It appears that *S. tenuifolia* is a highly variable taxon, containing forms referable to var. *hispida*. Whereas Fernald considered these pubescence forms as fairly distinct both morphologically and geographically, I have found continuous graduation from one to the other, and, at the same time, completely sympatric distributions for them.

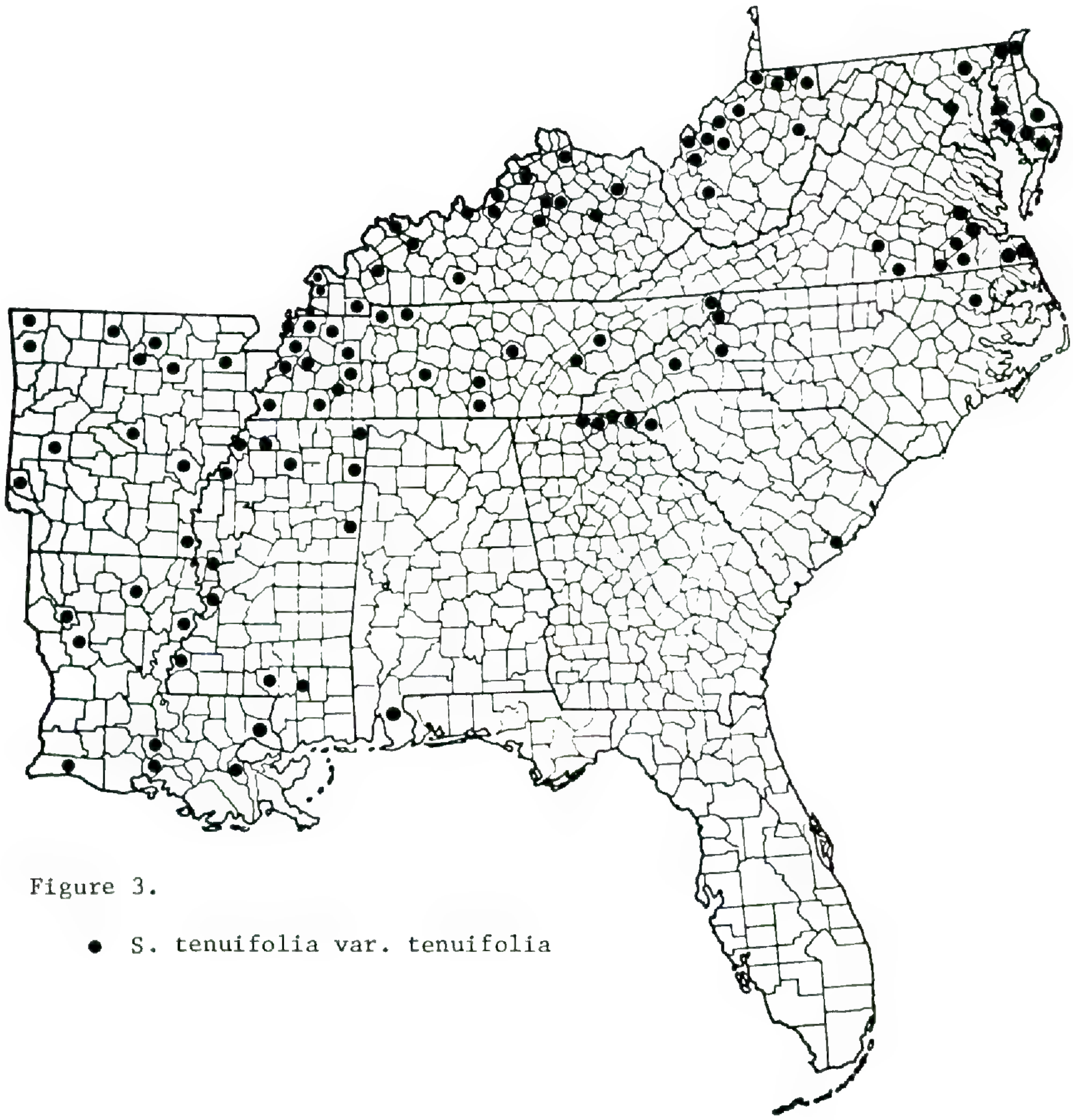

Figure 3.

● S. tenuifolia var. tenuifolia

Figure 3. Documented distribution of *Stachys tenuifolia* var. *tenuifolia*.

3b. STACHYS TENUIFOLIA var. PERLONGA Fern. Rhodora 45:466, pl. 788. 1943.

TYPE: U.S.A. VIRGINIA, Greensville Co.: *Fernald & Long 13435* (HOLOTYPE: GH!; ISOTYPES: MO, NY!, PH!, TENN!).

Flowering stems sparingly branched, the angles glabrous or sometimes with spreading trichomes. Leaves 9–12 cm long, with distinct, short petioles, nearly sessile, lanceolate with long-acuminate apices, the bases more or less truncate, both surfaces slightly hispid. Calyx tube and lobes about equal in length.

Lower Mississippi River valley from Kentucky to Louisiana and Mississippi, also on the Atlantic coast from Delaware to South Carolina (fig. 4). Low swampy woods.

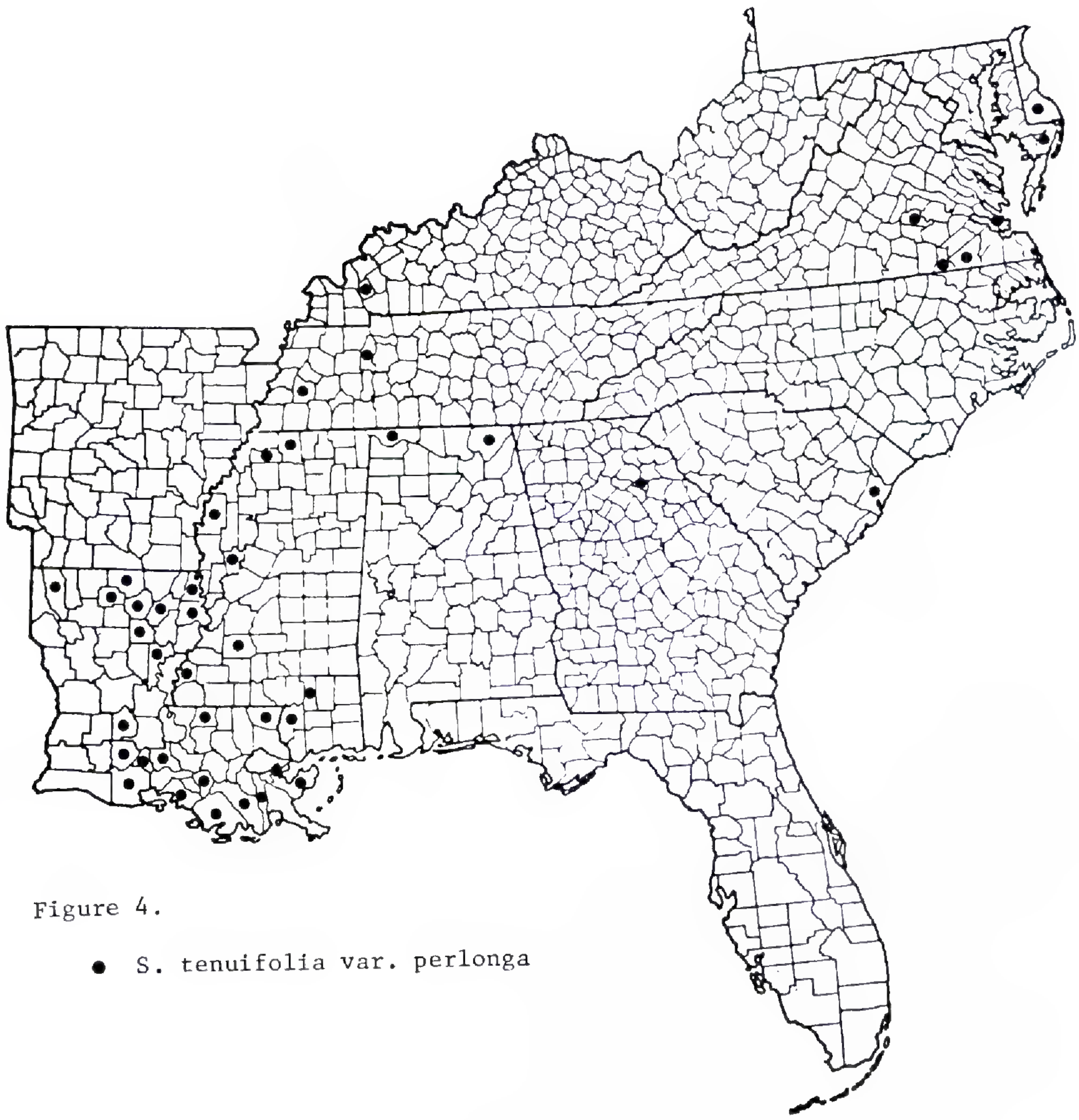

Figure 4.

● S. tenuifolia var. perlonga

Figure 4. Documented distribution of *Stachys tenuifolia* var. *perlonga*.

This variety is segregated largely on the basis of leaf shape, which is substantially different from that seen in *Stachys* elsewhere in our area. Plants from Virginia are the most pubescent; those from Louisiana and the Mississippi River valley are generally glabrous. The distribution map suggests that the variety is centered in two areas, with Georgia and Alabama forming a connecting bridge; these collections from Georgia and Alabama seem dubious, however, and may, in fact, have closer affinity to the typical variety.

3c. STACHYS TENUIFOLIA Willd. var. LATIDENS (Small in Britton) J. Nelson, Phytologia 46:94. 1980.

Basionym: *S. latidens* Small in Britton, Man. Fl. N. U. S. 793. 1901.
TYPE: U.S.A. VIRGINIA: White Top Mountain, *Small s.n.* (HOLOTYPE: NY!; ISOTYPES: F! MO(2)!, PENN!, PH(2)!).

Flowering stems often branching from fragrant rootstocks (when fresh), the stem angles roughened with short pusticulate trichomes. Leaves 10–18 cm long, the petioles short or well-developed, the blades elliptic to ovate, glabrous to almost scabrous (on the upper surface), the base rounded to nearly cordate. Calyx tube longer than the deltoid lobes.

Blue Ridge Mountains and upper Piedmont, from east-central West Virginia and central Virgina to upper Georgia and northwestern South Carolina (fig. 5). Mountain slopes, bottomlands, and summits.

I have seen a few sheets of this variety from western Pennsylvania, projecting its range farther northward. Along the Blue Ridge Parkway, extensive roadside populations have been noted in various counties of North Carolina. This variety in such areas is usually in moist drainage areas and in full sun; other populations along the Parkway appear almost weedy, spreading in planted shrubbery. Such colonies growing in the sun are, not surprisingly, sparingly branched and strong-stemmed. Shaded colonies are also frequent; I have seen several of these populations, including ones in southwestern Virginia, in which the stems are spindlier and have a tendency to branch. In study of herbarium material, I noted that *S. latidens sensu* Small varied somewhat in calyx-lobe length. The lobes of the specimens serving as isotypes fit the species description very well, the lobes being described by Small as "triangular, very short." These plants from which Small described his species are with calyces rather swollen (due to the presence of ripening mericarps within), causing the lobes to appear very short. Plants from the rest of the range may have calyx lobes similarly short, or longer, although the lobes are not so long as those of the typical variety or var. *perlonga*. Except for calyx-lobe features and geographic distribution, this plant closely resembles a form of the typical variety of *S. tenuifolia*. It seems most convenient to treat this entity as a variety of *S. tenuifolia* restricted to the Blue Ridge. Fernald's (1943) scheme would suggest var. *latidens* as the ancestral stock for the other two varieties of the species. Several specimens collected by Small from Washington County (at the same locality as the

holotypes) are labeled "*S. aspera* Michx." The herbarium labels on these sheets are identical with those on the type specimens (same collection data, altitude, printing) and the plants themselves are inseparable from the holotype and isotypes. For some reason, Small considered these collections different from his new species. Otherwise, they would be considered isotypes themselves had Small labeled them "*S. latidens*."

4. STACHYS NUTTALLII Shuttleworth ex Benth. in DC. Prodr. 12:469. 1848.
TYPE: U.S.A. TENNESSEE: Cumberland Mountains, *Rugel s.n.* Jun 1842 (ISOTYPES: KEW!, NY!).
S. cordata Riddell, Suppl. Cat. Ohio Pl. 15. 1836.
TYPE: U.S.A. OHIO: *Riddell s.n.* (HOLOTYPE: US!).

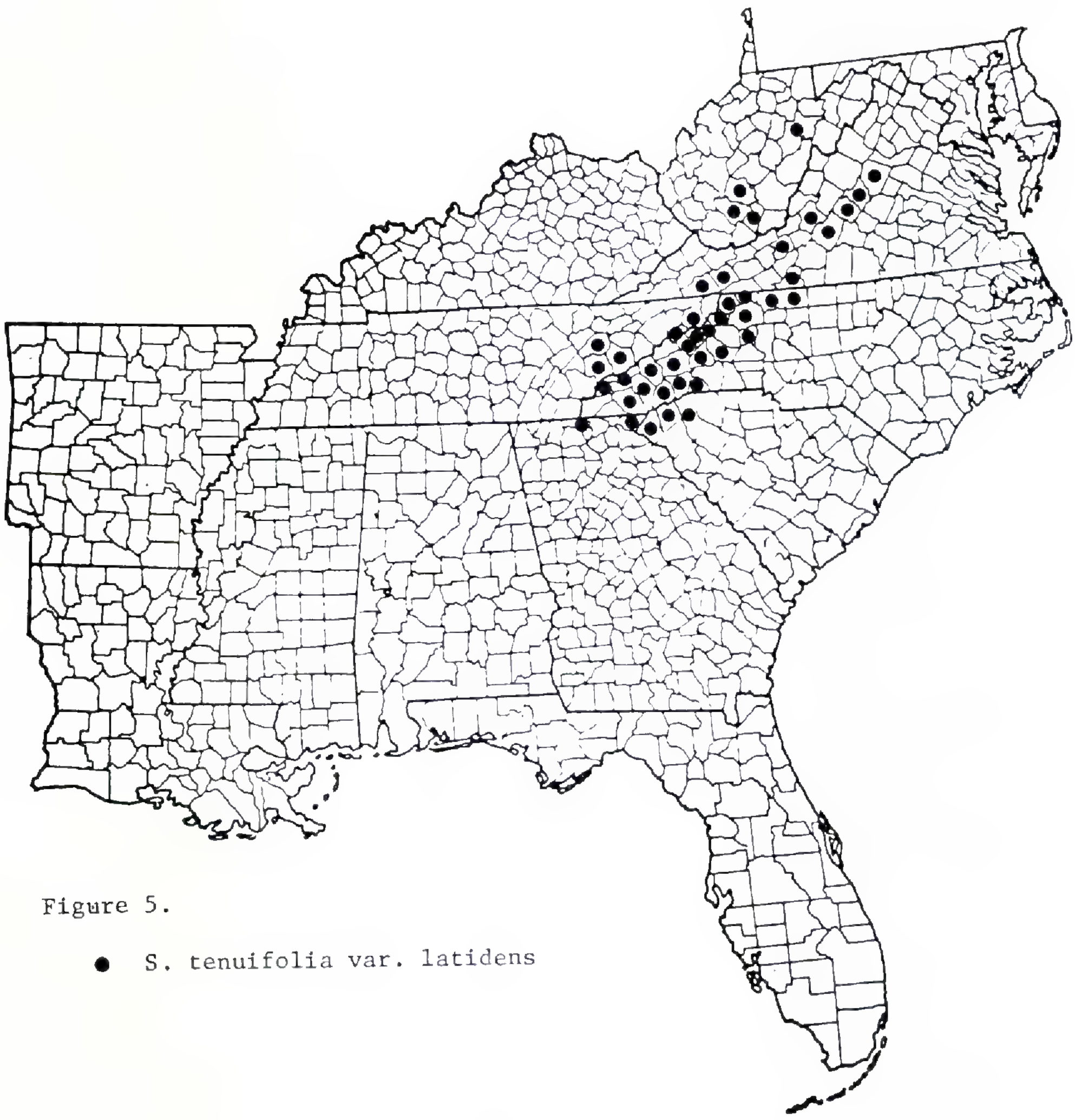

Figure 5.

● S. tenuifolia var. latidens

Figure 5. Documented distribution of *Stachys tenuifolia* var. *latidens*.

S. palustris L. var. *cordata* (Riddell) A. Gray, Man. Bot. N. States and Can. ed. 2. 317. 1856.
S. salvioides Small, Fl. S. E. U. S. 1032. 1902.
TYPE: U.S.A. TENNESSEE: White Cliff Springs, *Kearney s.n.* (HOLOTYPE: NY!).
S. riddellii House, Bull. N. Y. State Museum 233:60. 1921. Based on *S. cordata* Riddell.
S. subcordata Rydb., Torreya 27:88. 1927.
TYPE: U.S.A. VIRGINIA: Bedford Co.: *Rydberg s.n.* (HOLOTYPE: NY!).

Perennial, sparingly branched, from elongated, thickened rhizomes the stems 60–70 cm tall at flowering; stem angles hispid with scattered to numerous stiff, curly hairs (especially near the base), the stem sides minutely glandular-pubescent apically. Leaves 9–12 cm long, distinctly petioled, the apex attenuate, the margins serrated with broad, ascending teeth and often ciliate, the leaf base markedly cordate or sometimes merely rounded, the leaf blades widely ovate; leaf surfaces uniformly and equally pubescent with scattered straight hairs. Inflorescence an interrupted raceme to 12 cm long, with 5–11 axillary verticils, each 6-flowered, and with a pair of much-reduced hispid bracts, these further reduced up the inflorescence. Calyx slightly hispid, the tube longer than the acute lobes, each lobe short-awned. Corolla 13 mm long, white to light pink, finely glandular on the outer surface. Mericarps 2 mm long, broadly obovoid and rounded, dark brown.

West Virginia to Kentucky and Ohio, south to central Tennessee and western North Carolina (fig. 6). A forest species, no doubt shade tolerant, most common on bottomlands of the Blue Ridge Mountains.

Stachys salvioides Small and *S. subcordata* Rydb. are easily assigned to this species, representing variants in its range. Epling (1934) referred to *S. subcordata* as "an anomalous form"; to my knowledge it is known from only two collections in Virginia (one being the holotype). Dr. J. F. Matthews at the University of North Carolina-Charlotte has brought to my attention his collections of a *Stachys* referable to this species from Montgomery County on the Piedmont of North Carolina: this appears to be a rather interesting range extension for *S. nuttallii*. A visit to the site in the Uwharrie Mountains does indeed show typical shade-growing plants, the population extending from about 100 meters down the east shore of the Yadkin River.

5. STACHYS CLINGMANNII Small, Fl. S. E. U. S. 1032, 1037, 1903.

TYPE: U.S.A. NORTH CAROLINA: Clingman's Dome, *Beardslee & Kofoid s.n.* (HOLOTYPE: NY!).

Perennial, branched, 50–100 cm tall, from tuberous elongated rhizomes at or just below soil level. Stem angles copiously hispid with simple or jointed (2–3 celled) trichomes, these more numerous distally, the sides generally glabrous. Leaves 8–12 cm long, the distinct, hispid petioles apically shortened, blades ovate to narrowly elliptic, apices acute to long acuminate, margins coarsely toothed or crenate-denticulate, with teeth nearly at right

angles to the ciliate margin, base cordate to truncate or rounded, sometimes oblique, both leaf surfaces heavily pubescent with simple or multicellular hairs to 1 mm long, younger leaves generally with a dense indumentum. Inflorescence 8–21 cm long, with 9–14 axillary verticils, each 6-flowered and subtended by a pair of foliose, pubescent bracts, these elliptic to rhomboid. Calyx tube 4–5 mm long, about twice as long as the acute lobes, each lobe hispid along the margins and awned. Corolla 11–16 mm long, white with fine purple spots and lines, glabrous, or finely canescent on the outer surface of the upper lip. Mericarps 2 mm long, broadly obovoid, dark brown.

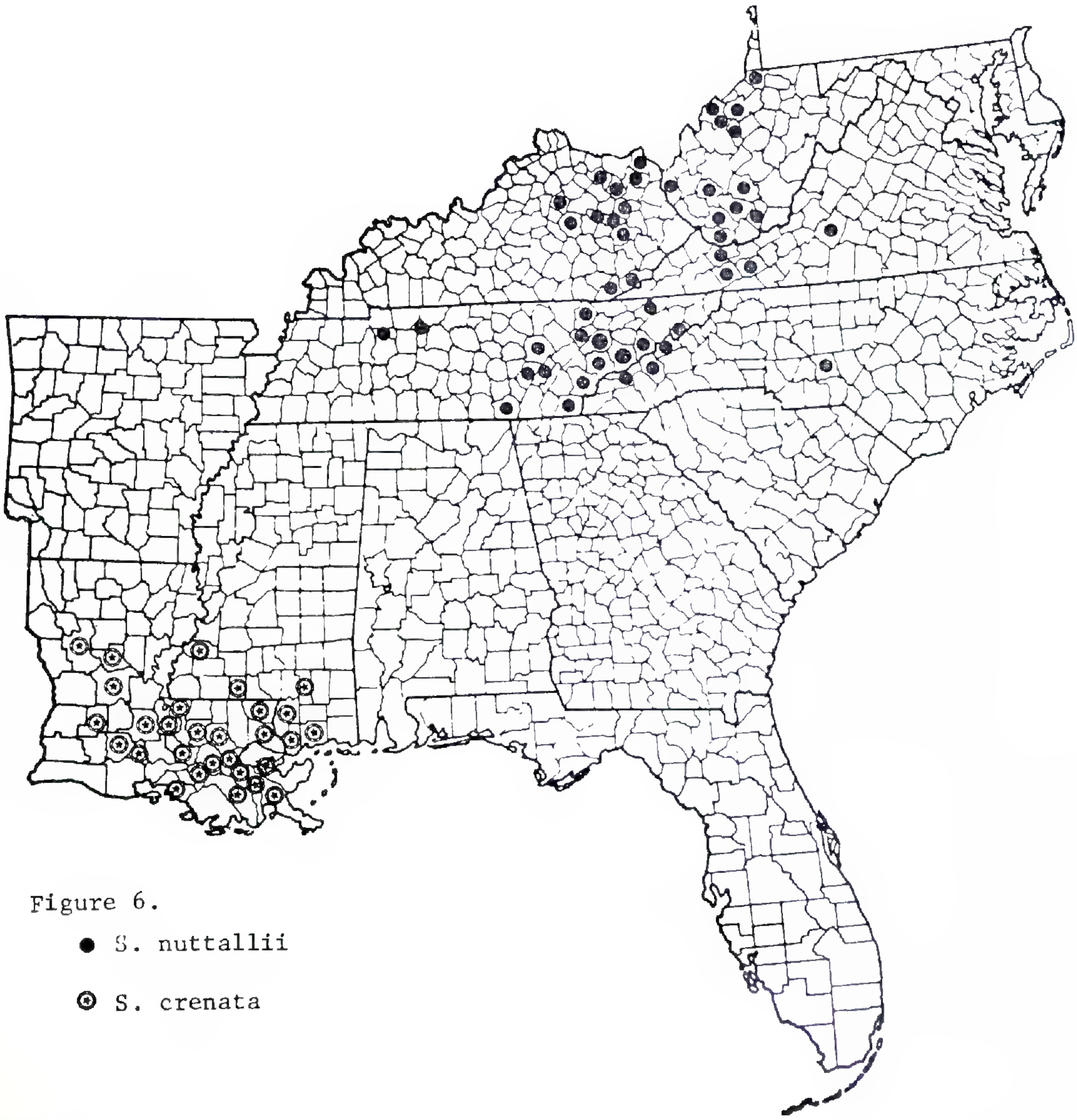

Figure 6.

● S. nuttallii

⊙ S. crenata

Figure 6. Documented distribution of *Stachys nuttallii* and *Stachys crenata.*

Sporadic in the Blue Ridge Mountains along the North Carolina-Tennessee boarder, south to Oconee County, South Carolina (fig. 2). A shade tolerant forest species found in cool, moist coves.

Epling (1934) referred to this species as "a dubious form," probably in light of its similarities to *S. nuttallii*. Further, he indicated its range as extending west to Indiana, possibly confusing it with something else (such as hispid forms of *S. tenuifolia*). Within the southeast, however, this taxon is fairly distinctive morphologically.

6. STACHYS FLORIDANA Shuttleworth ex Benth. in DC. Prodr. 12:478. 1846.

TYPE: U.S.A. FLORIDA: near Jacksonville, *Rugel 176* (ISOTYPES: BM, F, MO, US, NY!).

Perennial, erect, from rhizomes ending in whitened tubers, the nodes and internodes distinct. Flowering stems 8–64 cm tall, unbranched or highly branched from lower nodes; stem angles glabrous or with scattered trichomes, the sides glabrous or lightly pubescent near the apex. Basal and lower leaves 5–9 cm long, the petioles 1–5 cm long, upper leaves short-petioled to nearly sessile, 1–5 cm long; blades oblong to rhombic, the surfaces glabrous to sparingly pubescent with simple and jointed trichomes; apex acute to nearly obtuse, the margins crenate to crenulate, ciliate, the base truncate to shallowly cordate. Inflorescence 7–17 cm long, with 3–12 axillary verticils, each 6 (or fewer)-flowered; axillary bracts trullate, variously serrated. Calyx tube bristly-hispid, 6–7 mm long, about twice as long as the acute lobes, often reddish above. Corolla 13 mm long, the lower lip flaring, white to pink with purple spots. Mericarps 1.5 mm long, equally as broad, dark brown.

Almost throughout the southeastern United States, from Virginia southward through Florida, and to Louisiana (fig. 7). A weedy species found in many disturbed sites, *S. floridana* grows well in a variety of soil types, wet and dry. It can be found almost throughout the year, at least in the southern part of its range, in vegetative condition. Collections are known from the Florida Keys as well as from the Smoky Mountains.

From the standpoint of economic interest, this species is the most important one of the genus in the southeast, due to its great success as a weed. It is easily capable of establishing itself once the tubers are buried. Gibbs (1968) has noted, as have I (Nelson 1975), that *S. floridana* grows very well in nursery stock and ornamental greenhouses. The single most important reason for its expanding distribution must be its being moved in nursery stock, especially azaleas and camellias. Since Florida is one of the most active states in the ornamental nursery trade, it is possible that nearly all of the collections of *S. floridana* in the southeast could be traced, directly or indirectly, to Florida. Indeed, in practically every nursery in Florida I visited to search for this species, I have found it. This species' present distribution is based mostly on very recent collections. Shinners (1963) con-

sidered it to have been endemic to Florida until the 1940s or 1950s, when many populations began appearing outside the state. Once established, a population of *S. floridana* grows rapidly in confined or open areas, tending to choke out other plants if in a lawn or garden. Most attempts at eradication of the species fail: any disturbing of the tubers seems to encourage new growth. The tubers themselves are edible raw, though rather insipid, and, according to some herbarium label data, can be turned into pickles. A similar Asiatic species, *S. affinis* Bunge, is commonly cultivated in Japan for "Chinese artichokes"; Shinners (1963) suggests that this species is present in the southeastern United States as well, which, if true, suggests a strong similarity between the two species.

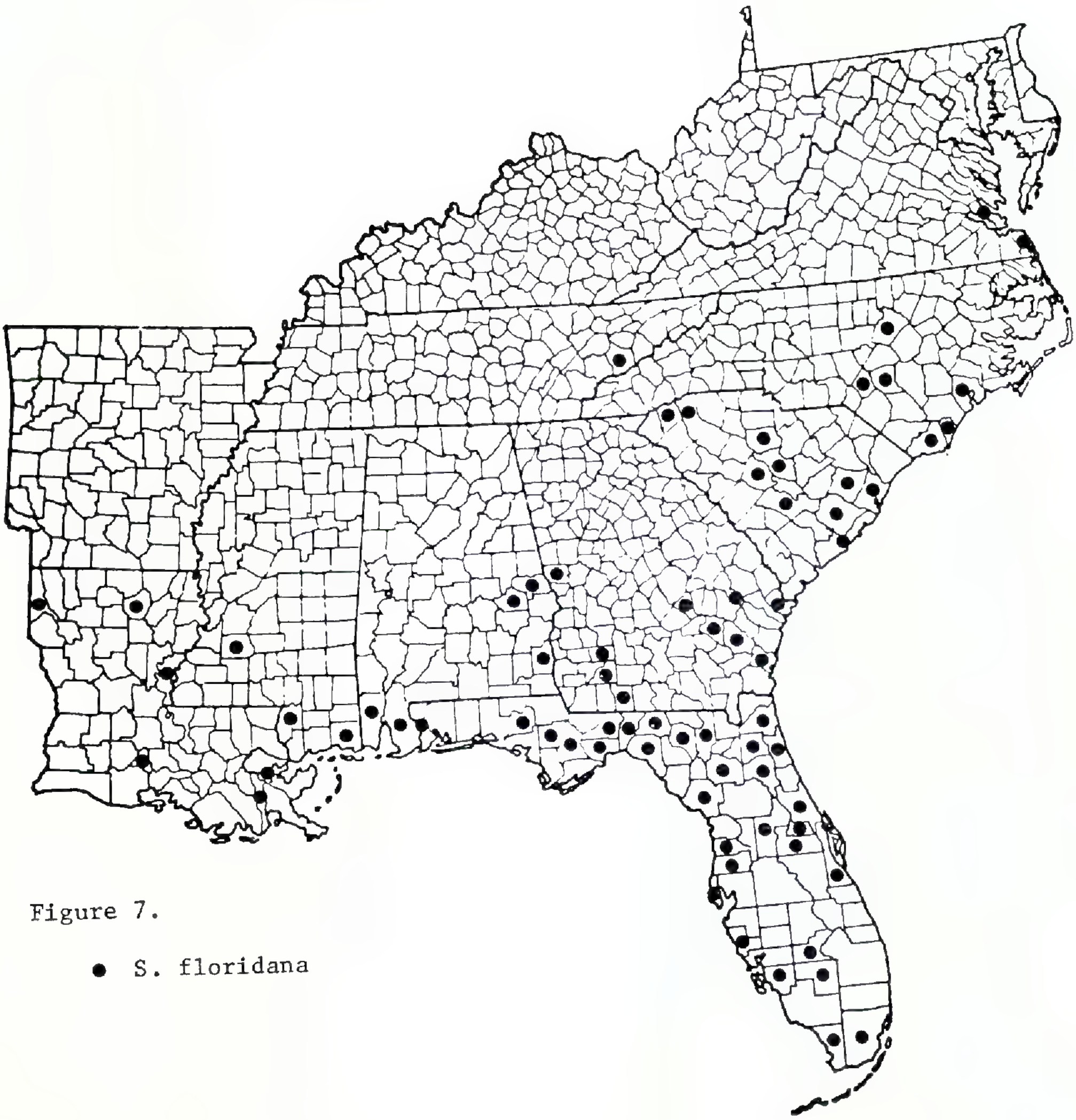

Figure 7.

- S. floridana

Figure 7. Documented distribution of *Stachys floridana.*

7. STACHYS CRENATA Raf., Florula Ludoviciana 42. 1817.

TYPE: U.S.A. presumably LOUISIANA (HOLOTYPE: unknown, possibly at P).
S. agraria Cham. & Schlecht., Linnaea 5:100. 1830.
TYPE: MEXICO, near Jalapa, *Schiede 143* (ISOTYPE: HAL, photograph!).
S. crenata Philippi, An. Univ. Chile 90:562. 1895.
TYPE: CHILE, near Carrizal (HOLOTYPE: not known).

Annual, sprawling or sometimes erect, from fibrous roots. Flowering stems 20–40 cm tall, highly branched from lower nodes, the angles and sides hirsute. Lower leaves 2–4 cm long, 1–3 cm wide, the upper leaves 2–3 cm long, 0.5–1.5 cm wide, ovate, obovate, or oblong, the margins crenate, crenulate, or nearly entire, sometimes ciliate, the base truncate to shallowly cordate, the apex acute, both leaf surfaces sparingly to copiously hirsute with long, soft trichomes, especially veins of lower surface. Inflorescence an interrupted raceme 4–20 cm long, with about 13 axillary verticils, each 6 (or fewer-flowered, each verticil subtended by a pair of foliose, subsessile bracts. Calyx short-pedicelled, with 2 minute hispid bracteoles, the tube 4–4.5 mm long, densely hispid, equal in length to the acuminate, hispid lobes, each lobe with a pointed, glabrous awn. Corolla scarcely exserted from the calyx, light purple with darker spots. Mericarps 1 mm long, flattened or depressed-obovoid.

Restricted in the southeast to southern Mississippi and Louisiana; ranging outside our area along the coast of Texas.

Both *S. crenata* and *S. floridana* occur in similar weedy habitats, especially disturbed areas around building sites. I have seen it along grassy highway medians and occasionally as a volunteer on gravelly rooftops. The two species are easily separable: *S. crenata* does not produce rhizomes or tubers and has much smaller flowers.

DOUBTFULLY ESTABLISHED SPECIES

STACHYS PALUSTRIS L. This circumboreal species is sporadically collected in the most northern of the southeastern states. It is a more important element of the North American flora outside of our range, being distributed from Labrador to Alaska and southwest to New Mexico.

STACHYS ANNUA L. Known in the southeastern United States only from Norfolk County, Virginia, this species might be expected rarely as a ballast weed.

STACHYS GERMANICA L. Rare and localized (perhaps as a garden escape), a rather striking plant due to its heavy pubescence. Known in southeastern United States from single sites in western Florida, central Tennessee, West Virginia, and Virginia.

STACHYS OLYMPICA Poir. Frequently cultivated for its silvery-lanate foliage, and occasionally naturalizing. This species occurs as a weed in New England and further northward.

ACKNOWLEDGEMENTS

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NOTES ON SOME "QUILL"-LEAVED UMBELLIFERS

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In doing write-ups of threatened and endangered plant species for the Forest Service during the period 1975–1980, I had difficulty in interpreting those *Oxypolis* and *Ptilimnium* that develop lineal, cross-septate, terete, quill-like leaves. This confoundment has led me to do some additional field work on such plants and also to consult some loans, for which I am indebted to curators and staffs at GA, UC, US and VSC! In fact, I was even so unenlightened as to refer, in manuscript preparation, to leaves of such plants as "phyllodia", but have been informed by Dr. Lincoln Constance that, according to his colleague Dr. D. R. Kaplan (Bot. Jour. Linn. Soc. V. 63, suppl. 1: 101–125. 1970), linear unifacial leaves in *Oxypolis* are not phyllodia, which are merely petiole, but actually petiole and rachis with the lateral leaflets suppressed. I have taken the liberty then, in title and text, of applying a shorter, hopefully not controversial term "quill-like", meaning this to apply to a leaf that appears phyllodial but is really both petiole and rachis.

A key to the quill-leaved *Oxypolis* and *Ptilimnium*, together with some supplemental observations, is presented below in hope that such might prove useful to others who may labor in these genera.

1. Plant perennial, either rhizomatous or stoloniferous, or increasing by crown buds; primary involucral bracts reaching 5–25 mm; petal blade strongly incurved, its apex strap-shaped, bluntish, nearly touching the alate petal midrib, its venation candleabriform; commissural face of fruit flattened parallel with that of flattened fruit ..... 1. *Oxypolis* Raf.
   2. Plants increasing by rhizomes and stoloniferous rhizomes, these developing from 2 or more of the lower stem nodes; lower internodes strongly suffused with pink or purple, the lower nodes leafless by flowering time; primary rays of umbel usually less than 10 (rarely 11, mostly 5–9); mature fruit peripherally dilated, usually thicker than the central area, the outermost ribs not confined to the seed cavity area ..... *O. canbyi* (C. & R.) Fern.
   2. Plants increasing by crown buds, the rootstock a caudex or a stout, short rhizome; lower internodes not pink or purple, the lower nodes generally with at least sheaths persisting, overlapping; primary rays of umbel mostly 10 or more (–20); mature fruit with ribs confined to the seed cavity, the fruit thickest there, progressively thinning to the edge.
      3. Petals, sepals, stamens, also often pedicels, dark red or maroon at anthesis; vigorous plants averaging 2 meters tall, with stem bases often 2 cm thick ..... *O. greenmanii* M. & C.

SIDA 9(2): 124–134. 1981.

3. Petals white or cream; stamens, sepals and pedicels not reddish at anthesis; plants mostly lower, more slender ..... *O. filiformis* (Walt.) Britt.

1. Plants annual (new rosettes may be produced from nodal buds, but live for but one flowering season!); rhizomes not produced; petal blade spreading at anthesis, only its caudate apex incurved; petal midrib not alate, the venation save for midrib not evident; commissural face of fruit at right angles to plane of mature fruit; primary involucral bracts no longer than 4 mm, or absent; seed in cross section nearly round ..... 2. *Ptilimnium* Raf.

1. OXYPOLIS Rafinesque, Neogen. 2. 1825.

Tiedemannia DC. Coll. Mem. 5:51. 1829.
Archemora DC. Coll. Mem. 5:52. 1829.

This is a small exclusively American genus with five distinct species occurring in the southeastern United States. The genus is distinguished by having five evident calyx teeth, by the dorsiventral flattening of the fruit, the ribbing (except in one species) appearing to be confined to 5 narrow ribs over the seed cavity, by the (in southeastern species) large oil tubes 6, with 4 alternating with the ribs over each seed cavity and 2 on the commisural side, and by the prominent, somewhat buttressed, short-conical stylopodium. The seed are in cross section flattened. All are plants of wetlands.

Of the southeastern species two have compounded leaves, namely *O. ternata* (Nutt.) Heller and *O. rigidior* (L.) Coult. & Rose. The first is a rather rare, slender plant confined to moist pineland savanna from southeastern Virginia south to northern peninsular and northwestern Florida. Its rootstocks produce whorls of short branches which develop fusiform tubers apically; its slender stems below produce a few, long, slender petioles terminating in three (rarely one) elongated-linear or linear-falciform entire leaflets and its few umbels have reduced involucres, capillary primary rays and compact, short-pedicelled clusters of yellowish-green-petalled florets late in the year, with fruit mostly ripening from October into December. Delicate foliage and maroon pigmentation make this a hard plant to spot in the autumnal grass-sedge! *O. rigidior* is fairly common and widespread in all eastern North American physiographic provinces, is normally a stoutish plant distinguished by its coarser leaves which are simply pinnate, the (3-) 5–9 (-13) leaflets usually obovate to oblong or elliptic, very firm, usually toothed, by the large umbels of white petalled flowers in late summer or early fall which later develop a prominently flat and corky-winged fruit typical of the genus. In this species as in all others many of the umbels produce shorter pedicelled male florets toward the center, or in some cases develop accessory compounds that are largely of male florets!

OXYPOLIS FILIFORMIS. Of the three quill-leaved species the most commonly seen is *O. filiformis*, which ranges in wet pinelands, cypress ponds, and broad grass-sedge marsh from eastern North Carolina south to southern Florida, the Bahamas and Cuba, west in the Gulf Coastal Plain into eastern

Texas. Its rootstock is caudiciform, less often a stout, ascending rhizome which develops as a lateral offshoot bud, its lower leaves are usually strongly overlapping at the level of the stoutish, fleshy, sheathing petiole, the terete, fistulose, septate blades erect or excurvate, stiffish and usually very brittle. In a normal season the stems are stoutish, sometimes fully a centimeter or more thick at base, and mostly range from one to two meters tall, the upper internodes rather distant, the upper leaves short-sheathed, rigid and linear-conical. The erect-peduncled umbels normally have involucral bracts at least 5 mm long (mostly 1.0–1.5 cm), the primary rays are stiffish, from 10–20, 2 cm or more long, terminate in shorter secondary involucres with mostly 10–20 pedicels, these developing white-petalled florets. The mature fruit is in character and overall dimension similar to that of the next species, namely:

OXOPOLIS GREENMANII is the largest species in the genus, with healthy plants often reaching 2.5 meters in height. Vegetatively this is similar to the preceding but quantitatively bigger in all respects save flower and fruit. It is the most narrowly endemic species, being found only in Franklin, Bay, Gulf and Calhoun counties in the Florida panhandle (lower Apalachicola-Chipola River drainage!) It differs strikingly from all other southeastern *Oxypolis* in the deep maroon pigmentation of its flowers and pedicels and is in the field so distinctive as to make one wonder how it could have escaped the written notice of taxonomists until 1942. The best habitat for it is found in the shallow, shrub-*Hypericum* bordered ponds that dot the Slash-pine-Saw palmetto-cypress-titi flats between Port St. Joe and Wewahitchka in Gulf County. Much of this original habitat is now endangered in that it is being ditch-drained, cleared mechanically and converted either to the monotony of pine plantations, large "improved" pastures or row crops. Thus *O. greenmanii* is a likely candidate for protection as an endangered species.

OXYPOLIS CANBYI (Coult. & Rose) Fern., Rhodora 41(484): 139. 1939.

Oxypolis filiformis (Walt.) Britt. var. *canbyi* Coult. & Rose, Contr. U.S. Nat. Herb. 7(1): 193–194. TYPE: U.S.A. DELAWARE. Sussex Co.: moist upland meadows. Ellendale, Aug 1867, *W. M. Canby* (HOLOTYPE: US!).

O. canbyi has an unusual geographic range. The wet meadows in Coastal Plain Delaware where it was first found by Canby no longer harbor it. Now it can be found only in South Carolina and Georgia where it is local in shallow cypress-pine sloughs or in wet grass-sedge savanna. Some localities for it have passed unnoticed in that flowering specimens collected without the distinctive rhizome bear a strong resemblance either to *Oxypolis filiformis* or to specimens of quill-leaved *Ptilimnium*, and have been so identified. M. L. Fernald, taking note of the different leaf and very different fruit elevated its rank to that of species, but for some reason did not observe the rhizomal character (nor for that matter did Coulter and Rose!)

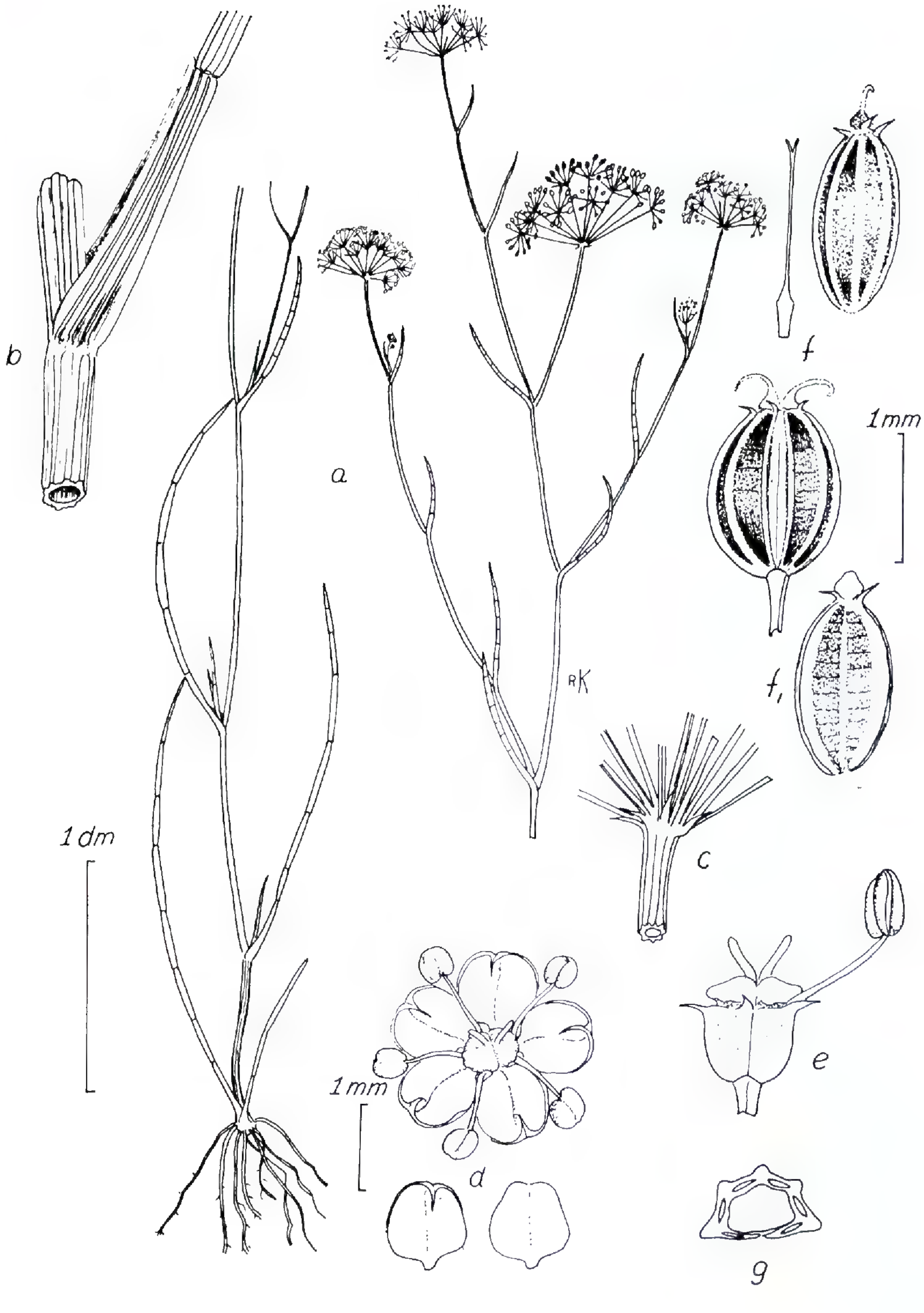


Fig. 1. *Oxypolis canbyi.* a. habit sketch (*Kral 56164*); b. enlarged view of node and leaf base (*Kral 60814*); c. flower viewed from below (upper left), from top with stamens removed (lower left), from side; d. various views of petal, including cross-section (*Kral 62314*); e. anthers; f. mature fruit of *O. filiformis* (*Kral 32625*); g. mature fruit of *O. canbyi* (*Kral 60814*).

which is so unlike that of any other *Oxypolis*. The good stands of it yet to be seen in the flatlands between Albany and Leesburg and between Leesburg and Leslie in southwestern Georgia have provided me the basis for the following remarks.

The rootstock of *O. canbyi* is a fairly slender, ascending rhizome that develops as a branch bud from rather deep-set, slender, forking horizontal rhizome. This ascending rhizome expands distally into an erect, purplish or pinkish, short-internoded, fistulose stem base which is usually submersed or embedded in peat-muck and which produces from its close-set nodes whorls both of roots and lax, elongate, pale, stoloniferous rhizomes, some several decimeters in length and which root at their distant nodes to produce new plants. In short, this is a strongly cloning species which can in some cases become an aspect dominant.

Secondly, *O canbyi* has slender, whip-like, elongate, gradually tapering cauline leaves, the bases of which are abruptly dilated and clasping but definitely are not as stout as in the preceding species. Neither are the plants averaging as tall.

The umbels produced per normal plant are fewer, usually three, with less primary rays, usually 10 or less, ranging down to six, and the whole umbel ranges narrower. The flowering season is earlier than it is for contiguous populations of *O. filiformis*; *O. canbyi* begins to flower in May, continues into early August. Neighboring populations of *O. filiformis* are usually budding and flowering at a time when mature fruit is forming in *O. canbyi*. However, it should be noted that flowering times in this genus appear to be latitudinally related, that the now extinct population of *O. canbyi* from Delaware flowered in August, and that *O. filiformis* has over its total range a flowering time that covers most of the year!

It is in the fruit that *O. canbyi* is most different. While in the other species the ribs of the fruit overlie the seed or directly border it, the two peripheral ribs of an *O. canbyi* mericarp overlie a dilated corky tissue well toward the fruit edge. (See plate comparing fruit of the two types!).

This plant is seriously endangered in that much of its original habitat has been, or is being, destroyed. The shallow flatwoods ponds and low pineland savanna which are its best habitat are being ditch-drained, then bulldozed and converted to lowland pasture, to row crops (usually soy beans) or to pine plantations so that some areas known to me now have *Oxypolis* persisting only in ditches at edges of fields or plantations. I have yet to learn of any locations that are presently protected! Thus it is to be hoped that those botanists in the southeast who read this are alerted to looking for new localities for *O. canbyi* and will move to protect the plant.

Specimens examined: DELAWARE. Sussex Co.: moist upland meadow land near Ellendale, Aug 1867, *W.M. Canby* (Type!); Aug, 1874, *Canby* (US); swamps, *A. Commons,* 16 Aug 1877; Sep 1891, *Canby* (US). (All of these are presumably from the same station, which has been for many years destroyed!) GEORGIA. Burke Co.:

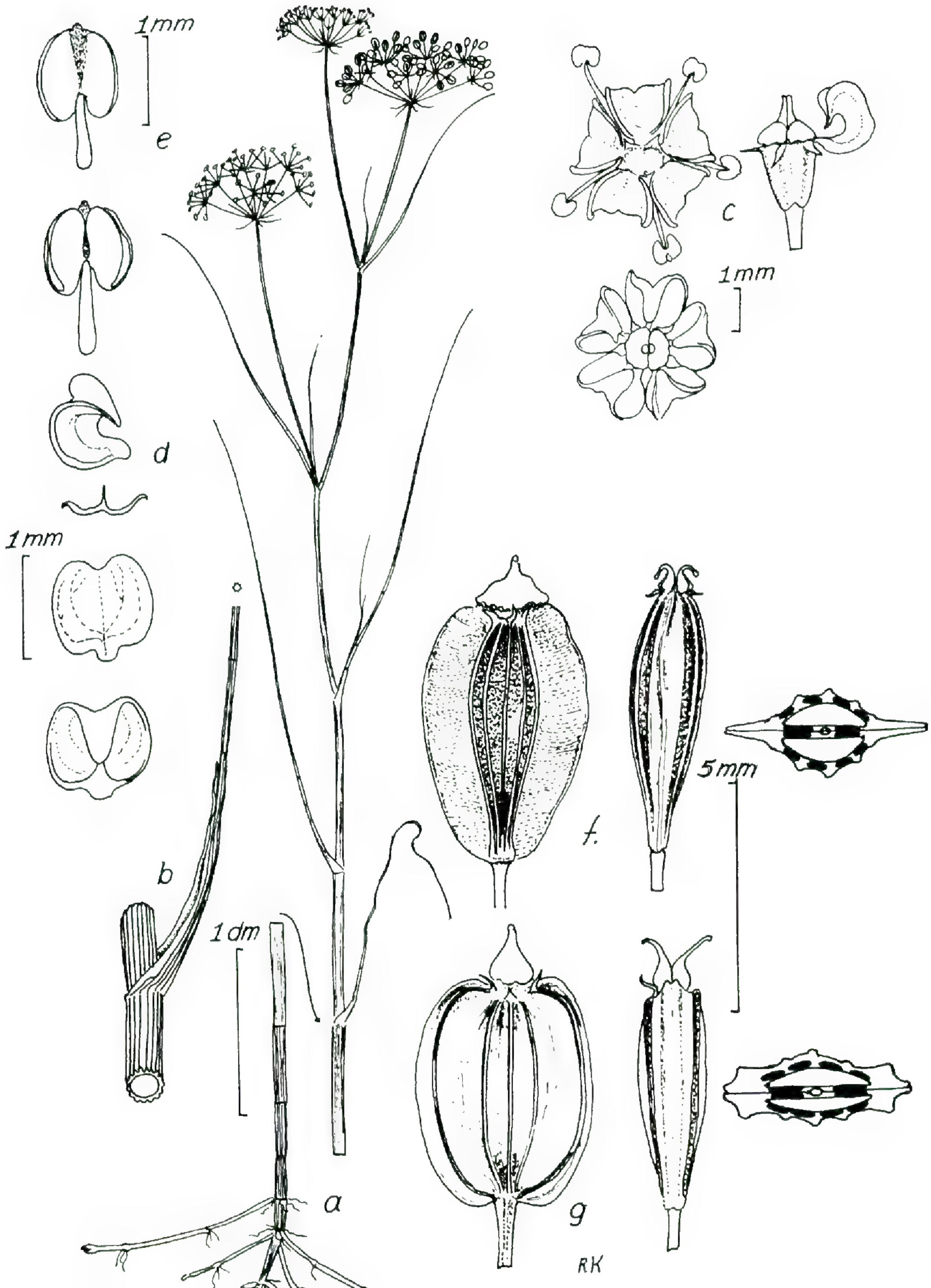
sandy peat of cypress-bottom by Ga. 24, ca 7 mi W Waynesboro, 31 Jul 1980, *Kral 66049;* pond pine-pond cypress swamp by Ga. 24, 8.2 mi W Waynesboro, 7 Aug 1975, *Kral 56164.* Dooly Co.: open partially drained cypress pond of W side of railroad, 2.7 mi SSE Unadilla, 31 Jul 1953, *Duncan, Harper, et al 16814* (GA); cypress pond about half way between Unadilla and Pinehurst, 31 July 1953, *Harper 4255* (ALU, GA, VDB). Lee Co.: moist pine barrens near Adams, 1 Aug 1901, *Harper 1147* (US); grassy area in cypress swamp in standing water with *Lobelia boykinii,* 10 mi N Leesburg, 22 Aug 1940, *McVaugh 5235* (UC); moist pineland-cypress swamp area 6 mi NE of Leesburg, 22 Aug 1948, *Thorne & Muenscher 8352* (UC); flatwoods pond edge by US 19, ca 5 mi N Leesburg, 28 Jun 1977, *Kral 60502*; same locality, 20 Jul 1978, *Kral 62314*; drying bottom of shallow flatwoods pond by US 19, ca 5 mi S Leesburg, 19 Aug 1977, *Kral 60814.* Sumter Co.: disturbed pineland pond by US 280, ca 5 mi NW Leslie, 2 Aug 1980, *Kral 66083.* SOUTH CAROLINA. Colleton Co.: cypress-*Ilex* pond on S.C. 63, 2.8 mi SE Snider's Crossroads, jct. S.C. 21 and 63, *Radford & Bozeman* 11439 (GA, NCU, VSC, VDB). Hampton Co.: savanna along railroad, 0.2 mi N of Luray on US 321, 29 Jun 1956, *Bell 3949* (NCU, VDB).

2. PTILIMNIUM Rafinesque, Am. Mo. Mag. 4: 192. 1819; Neog. I: 2. 1825.

Discopleura DC. Coll. Mem. 5: 38. 1829.
Harperia Rose, Proc. U.S. Nat. Mus. 20: 441. 1905 (non *Harperia* Fitzgerald, 1904).
Harperella Rose, Proc. Biol. Soc. Wash. 19: 96. 1906.

This genus was carefully studied by Dr. N. W. Easterly (1957) and needs no further nomenclatural qualification. The only species described as *Ptilimnium* until the quill-leaved ones were discovered were the commoner, more widespread, pinnately-decompound-leaved ones, namely *P. capillaceum* Raf. (type for the genus!), *P. costatum* (Ell.) Raf., and *P. nuttallii* (DC) Britton, all of which have an involucre of conspicuous bracts at least 5 mm long. The quill-leaved plants now referable to *Ptilimnium* and which have involucres small or totally absent were all described by Rose (1906) as three *Harperella.* These, after transferal to *Ptilimnium* by Dr. Mathis (1936) were reduced to but two species in Easterly's (l.c.) treatment, namely *P. nodosum* (Rose) Mathias, a tallish, more profusely floriferous, non-proliferous annual from the Coastal Plain of Georgia and *P. fluviatile* (Rose) Mathias (including *P. viviparum* (Rose) Mathias), a lower and riverine plant tending to be fewer-flowered and proliferous.

These plants, whatever their true taxonomic status, are rare, though they may be extremely abundant in a few of their known localities. For years plants referrable to *P. nodosum* were known only from two places in the Coastal Plain of southwestern Georgia, but additional localities in Aiken County, South Carolina were later found. On the other hand Easterly cited more localities for *P. fluviatile*, reporting it from scattered localities along the Potomac and tributaries in West Virginia and Maryland, southward to the Deep and Tar Rivers in Chatham and Granville counties respectively in North Carolina, and inland into the Cumberland Plateau of Alabama (Cullman, DeKalb counties). For some reason he did not cite collections made from Cherokee County Alabama made by Harper as well as some also made by Harper (and in fact also by Easterly) from the North River



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in Tuscaloosa County Alabama.

In order to get some decent concepts of the two plants I have made some attempts to locate good populations of both. In the case of *P. fluviatile* this was not difficult in that it is still locally abundant along the Little River in northeastern Alabama, thus it was possible to get a good idea of the variation within these populations.

Finding *P. nodosum* localities provided more of a problem in that even at the time Easterly did his fieldwork he was able to find but one surviving population of the two then known, namely the one south of Unadilla, Dooly County, Georgia, originally discovered by Dr. Harper; the type locality in Schley County appeared to have been lost. However, there were reports of the plant still existing in Aiken County, South Carolina and I was able, thanks to directions given by Dr. D. Rayner of the South Carolina Heritage Program, to locate a good population there. This consisted in 1980 of many hundreds of plants growing in a wet peaty fringe around a shallow upland pond, a habitat similar to that described for the type from Georgia. A study of this population plus the *P. fluviatile* from along the Little River in Alabama, has allowed me to make more sense of specimens of such plants collected over their entire range, as well as to suggest a more conservative taxonomy.

The differences between *P. nodosum* and *P. fluviatile* as given by Rose (l.c.), Small (1933), Easterly (l.c.) and later by Radford et al. (1968) in composite have to do with the former being taller (3.5–10.0 dm versus 2–5 dm) with rays more numerous (6–15 versus 5–7) and longer, with pedicels 3–6 mm long (versus 3 mm or less) and flowers 3.0–3.5 mm wide (versus 1.0–1.5 mm). The former is supposed to bloom earlier (May and June) than the latter (July to October). The former is non-proliferous while the latter develops proliferous nodes which root when the main stem topples to produce tufts of overwintering phyllodes.

Unfortunately, none of the character differences given above hold up with sufficient consistency. Fruit characters employed by Small (l.c.) do not hold.

Large samples of *P. fluviatile* from along the Little River show a complete range from low, much-branched, delicate, proliferous plants with rosettes of leaves and few-rayed, smaller-flowered umbels similar to the type of *P. fluviatile* all the way over to tall, more robust, non-proliferous individuals with larger and more florets on longer rays that could well be fitted into the type material of *P. nodosum*! The few specimens collected

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Fig. 2. *Ptilimnium nodosum*. a. habit sketch (*Easterly 17*); b. enlarged view of node and leaf base; c. enlarged view of base of primary rays and involucre; d. top view of floret (above), upper view of petal (lower left), lower side of petal (lower right); e. side view of gynoecium at anthesis; f. carpophore and anterior view of mericarp (top), side view of fruit (below); f-1. commisural face of mericarp; g. median-cross-section of mericarp. (f-g from *Kral 66052*).

from along the North River in Tuscaloosa county Alabama, and those from the Eastern seaboard rivers also vary widely.

Inspection of the total habitat occupied by these plants in the Little River system provides a possible answer, in that the larger plants are usually from well-spaced individuals from the higher seep areas which are rarely inundated, while the lower, smaller-rayed and flowered individuals are rather consistently from places that are flooded frequently. Thus the latter tend more to be toppled by flood water, would therefore tend to root along the nodes, while the former, not so subject to frequent flooding, would tend to keep an erect and non-proliferous habit. The taller plants are also more likely to be "trained" erect by the greater abundance and size of other herbs more suited to higher seep areas. The *P. nodosum* from the Coastal Plain of South Carolina again shows a wide range in regard to all critical characters save that the plants do not develop from leafy tufts. This is probably explained in terms of the different sort of habitat afforded, in that the plants, being part of a strong fringe of grass-sedge around ponds, are less likely toppled, thus would tend less to formation of proliferous and overwintering nodes. Whatever the case, taller plants from Little River fit as well within the range of the South Carolina material as they do within the type material from Georgia. Only the very large extremes of *P. nodosum*, the Harper collections from Dooly County, Georgia, show a break, with by far the largest umbels, the stoutest stems.

The upshot of this is that there appears to be no way to draw descriptions and keys that take the common variation into account and yet distinguish two species or even two varieties. Two other facts also shed light. First, the haploid chromosome complement for both of the quill-leaved *Ptilimnium* is six, an indication of a similar genetic system. (*P. capillaceum, P. costatum* and *P. nuttallii* are according to Easterly 14, 16 and 7 respectively!) Secondly, a homologous variation as to size of plant, number of primary umbel rays, size of and number of florets and fruit may be found in the compound-leaved species of *Ptilimnium*. This range too may be explained perhaps in terms of habitat differences or even in simple spacing of individuals within a population. Any large collection of *Ptilimnium* shows this, with larger plants wide-spaced.

Therefore it seems appropriate to treat *P. nodosum* and *P. fluviatile* as instances of extreme variation brought about by ecological extremes in that too many instances of intermediacy in key characters exist for one to do other than treat the two taxa as one. The earliest name is *P. nodosum* (Rose) Mathias.

Specimens examined: ALABAMA. Cherokee Co.: among rocks below high water along Little River in May's Gulf on Lookout Mt., 15 Aug 1945, *Harper 3393* (NY, US); siliceous rocky banks of Little River just S of Canyon Mouth Park branch of DeSoto State Park, 30 Aug 1969, *Kral 36582* (VDB). Cullman Co.: Cullman, swamps, 1887, *Mary Mohr* (US). DeKalb Co.: rocky bed of Town Creek on Sand

Mountain near Chavies, 24 Nov 1905, *Harper 8* (HOLOTYPE: US; ISOTYPE: NY of *P. fluviatile*!); rocky bed of Little River on Lookout Mt., 25 Nov 1905, *Harper 14* (NY, US); miry shallows of Town Creek below the falls, N of Geraldine, 28 Aug 1933, *Harper 3100* (US); miry shallows of Town Creek above the falls, N of Geraldine, 28 Aug 1933, *Harper 3097* (NY, US—tall material much like Potomac River specimens of *P. viviparum*, evidently silt-coated and bent so as to root and bud); along Town Creek above the falls at Elrod's Bridge on Sand Mountain, 28 Aug 1933, *Harper 3097* (NY); abundant in Little River at State Rt. 35, ca 14 mi NW of Gaylesville, 7 Jul 1978, *R.R. Haynes 6589* (VDB); along cracks in sandy flatrock shallows, also sunny seeps, Little River above Ala. 35 bridge, 27 Jul 1977, *Kral 60635* (VDB, a large population sample showing wide and overlapping morphological range!); rocky shoals of Town Creek near Chavies, rte 110, 15 Aug 1956, *W. Easterly 151* (US). Tuscaloosa Co.: rocky shoals in North River, ca 14 mi N of Tuscaloosa, 30 Jun 1936, *Harper 3530* (NY, US—tall and non-viviparous as in *P. nodosum* proper but few primary rays, as in *P. fluviatile*); rocky shoals of North River 15 mi N of Tuscaloosa, Rte 43, 14 Aug 1956, *W. Easterly 141* (US & NY respectively—tall plants similar to the type in regard to length of rays and size of florets; this locality has since been destroyed, is now Lake Tuscaloosa!). Walker Co.: Fowl Shoals, very scarce, *E. A. Smith*, Aug 1877 (US). GEORGIA. Dooly Co.: in large shallow pine barren between Pinehurst and Unadilla, 21 May 1904, *Harper 2220* (NY, US—paratype—by far the largest material ever collected of the species with stem bases to 1 cm thick, inflorescence rays up to 16, flowers fully 3.5 mm across!); 2 mi S of Unadilla along railroad, dried out ditch, 17 May 1955, *F. H. Sargent 7210* (GA—this material quite comparable to the Schley Co. holotype!) drainage ditch along Southern railroad, 2 mi S of Unadilla, Rte. 41, 30 May 1956, *Easterly 16* (NY), *Easterly 17* (US). Schley Co.: shallow (now dry) pond near Ellaville, 10 Jul 1902, *Harper 1411* (HOLOTYPE: US, ISOTYPES: NY!— material comparable to this may be found in DeKalb Co. Alabama and Aiken Co., South Carolina!). MARYLAND. Washington Co.: near Hancock, 5 Oct 1910, *J. N. Rose* (UC, US—type material showing a low stature, few primary rays, vivipary—this is the original material of *P. viviparum* (Rose) Mathias!); gravel beaches, Potomac River, 1.5 mi W of Hancock, 13 Jul 1906, *Shreve & Jones 746* (NY, US—this shows a tallish habit, is a flood reaction with viviparous habit!). NORTH CAROLINA. Chatham Co.: Moncure, 7 Aug 1956, *Bell 4410* (NY, UC); in gravelly seeping soil, rocky bed of Deep River behind Lockville Dam, 2 Aug 1955, *Beard 1244* (NY); 150 yds. below Lockville Dam, 7 Aug 1956, *Beard 1286* (UC). Granville Co.: in sand bar in middle of Tar River, 10 mi S of Oxford on hwy 96, 4 Jul 1956, *J. P. Gillespie 397* (UC—this shows a tallish habit, leaves thick as in extremes of the Georgia material, primary rays no more than 6!). The North Carolina specimens show a range from small extremes of *P. fluviatile* well into type material of *P. nodosum* as to height and leaf character! SOUTH CAROLINA. Aiken Co.: ca 1 mi S Monetta just NE of Rte. S.C. 29, pond bank, 31 Jul 1980, *Kral 66052* (VDB—population sample showing a good range between *P. nodosum* and *P. fluviatile*!); distributed savannah-like area, Montmorenci, 10 Jun 1962, *Ahles & Baird 56922* (NCU, UC, VSC –the same as the Monetta material!). WEST VIRGINIA. Jefferson Co.: near Harper's Ferry, *Dr. Aiken*, no date or collection number (NY). Morgan Co.: wet bank of Sleepy Creek at jct. with Rte. 9, 21 Jul 1956, *Easterly 121* (US—a fairly tall, erect specimen but with short, few primary rays!)

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FIRST REPORT OF *PORTULACA AMILIS* (PORTULACACEAE) IN THE UNITED STATES[1]

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Portulaca amilis Speg. is a weedy South American species of wide distribution. It occurs from the southern portion of the Amazon basin southward across Brazil (Prov. Minas Gerais, Mato Grosso, and Rio de Janeiro) to Paraguay, the extreme northwestern part of Uruguay, and adjacent areas of northeastern Argentina. Within its native range this species is most frequent in sandy situations, being especially characteristic of disturbed sites in populated areas (Legrand, 1962).

In 1974 a collection was made of the species in Pasco County, Florida and was sent to the University of Florida Herbarium for identification. Subsequent collections were made in other areas of peninsular Florida. However, it was not until recently that this "unknown *Portulaca*" was identified as the South American *P. amilis* by the senior author.

An examination of the herbarium collections at the University of Florida and University of South Florida reveals the species to be distributed throughout much of Florida (see list of representative specimens). The earliest Florida collections are from the Tampa Bay area (Hillsborough Co., 1962; Pinellas Co., 1963) and from Duval County (1965). However, the earliest collection from the United States seen by the authors is not from Florida, but one made in 1956 from Harnett County in central North Carolina. The authors have seen material from Georgia and South Carolina, and the species may also occur in other adjacent southeastern states. The exact location(s) and date(s) of introduction of the species into Florida, Georgia, and the Carolinas are not known. It is quite likely that there may have been several introductions and that the species may have been established in our flora much longer than the first known collections indicate. As expected the species is known only from disturbed sites such as pastures, newly cleared pinelands,

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gardens and cultivated fields, road shoulders, lawns, and even parking lots. To date it has been collected only on sandy soil.

Portulaca amilis is a member of subgenus *Portulaca* as are all of the southeastern United States portulacas (Legrand, 1962; Bogle, 1969) and belongs to section *Catoclasis* (Legrand, 1962). *Portulaca pilosa*, *P. smallii*, and *P. grandiflora* are also placed within this section. However, Legrand placed these three species in subsection *Pilosae* and *P. amilis* (along with its South American relatives such as *P. striata, P. obtusa, P. lanuginosa*, and *P. gilliesii*) in subsection *Cuneiformes*.

Portulaca amilis is very showy and has potential as a cultivated ornamental. Plants are prostrate to decumbent annuals with fleshy, flat, narrowly to broadly obovate leaves. The leaves vary from 4–20 (or rarely 26) mm long and from 1.5–6.5 (or occasionally 9.5) mm wide with acute to acuminate or rounded-mucronate apices. The conspicuous axillary hairs are brownish to white and from ca 3–8 mm long. Its flowers are showy, to 2 cm across, intensely pink to pink-purple (grading to salmon-colored at the petal-base) and are borne in terminal heads subtended by an involucre of 6–8 (rarely 10) leaves. (Yellow-flowered individuals occur in South America.) The two sepals are ovate-triangular and 3–5 mm long. The petals are strongly obovate. Each flower has from 15–45 stamens. The circumscissile capsules open near the middle to release numerous more or less shiny black or dark brown seeds about 0.4–0.5 mm in diameter. The seed coat is nearly smooth to obscurely papillose. (All measurements except flower width are based upon dried material.) Figure 1.

This species is easily confused with *Portulaca pilosa* since both have conspicuous brownish to white hairs in their leaf axils and pink flowers. However, *P amilis* is easily distinguished from *P. pilosa* by its large, flat, more or less obovate leaves, larger flowers, and smaller, obscurely papillose seeds. *Portulaca amilis* is of course easily separated from *P. oleracea* because of its pink (vs. yellow) flowers, leaves with conspicuous axillary hairs, and acute to mucronate leaf apices.

Although little is known of the reproductive biology of *P. amilis*, it is of interest. It often grows with both *P. pilosa* and *P. oleracea* and its flowers are reported to open and close about 90 minutes earlier than those of *P. pilosa*.

The following key is provided to briefly compare the Florida species of *Portulaca* and to facilitate their identification.

KEY TO NATIVE AND INTRODUCED SPECIES OF PORTULACA IN FLORIDA

1. Hairs of leaf axils inconspicuous, at most ca 1 mm long ..... *P. oleracea L.*
1. Hairs of leaf axils conspicuous, greater than 3 mm long ..... 2.
   2. Leaves flat, oblanceolate to obovate, largest involucral leaves at least 3–6 (–8) mm wide ..... *P. amilis* Speg.
   2. Leaves terete or nearly so, linear or very narrowly ovate to elliptic (rarely very slightly oblanceolate), largest involucral leaves 1–2 (–2.5) mm wide ..... 3.

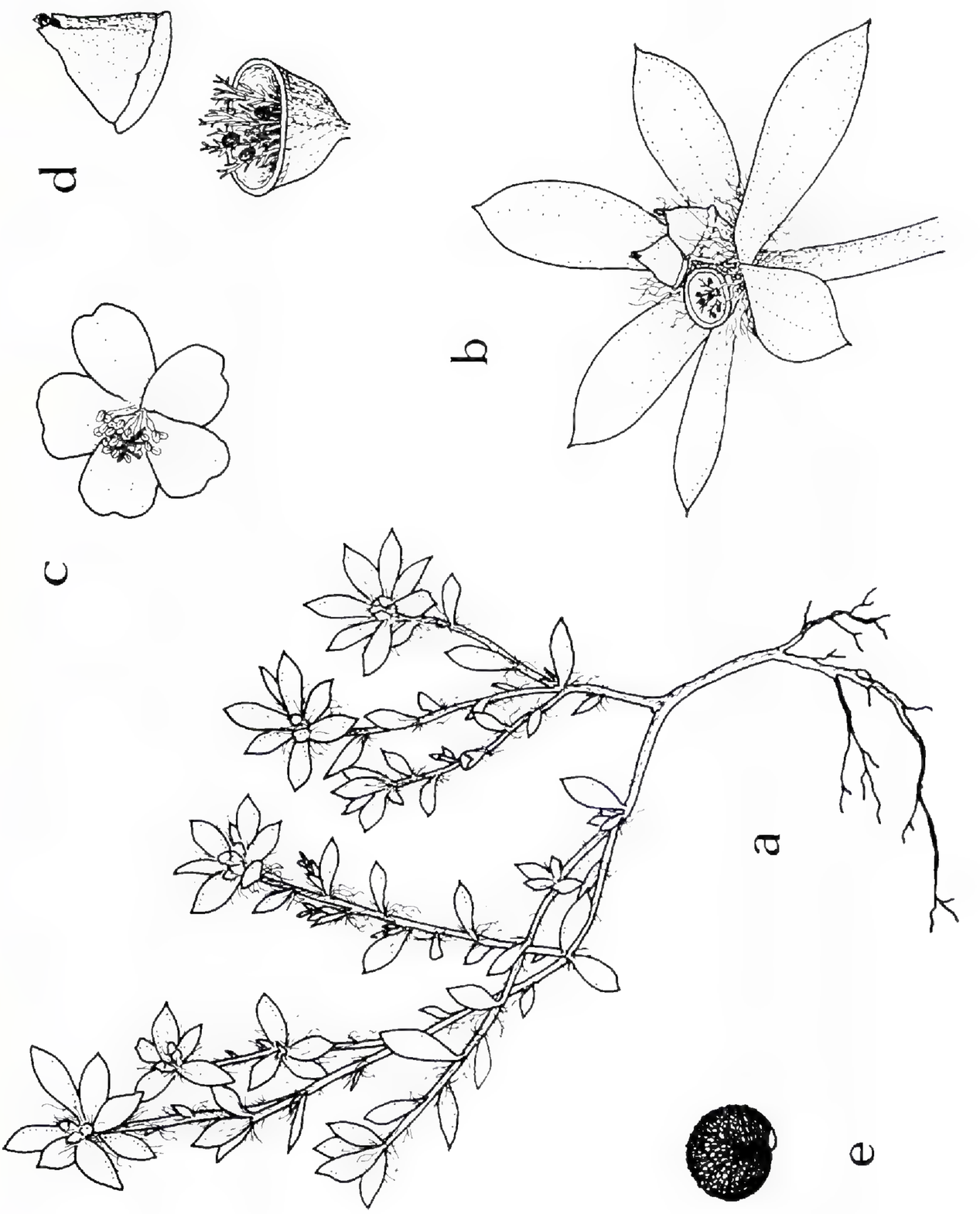

Figure 1. *Portulaca amilis*. a, habit, x 0.5; b, involucrate cluster of capsules, x 1.5; c, flower, x 1.5; d, fruit (circumscissile capsule); e, seed, x 18.

3. Corollas 3–5.5 cm wide ..... *P. grandiflora* Hook.
3. Corollas less than 1.5 cm wide ..... 4.
   4. Major stem(s) more or less erect; corollas yellow ..... *P. rubricaulis* HBK.
   4. Major stem(s) more or less prostrate to decumbent; corollas pink to rose-purple ..... *P. pilosa* L.

An effort should be made to determine more accurately the geographical distribution and possible economic importance (both as an ornamental and a problem-weed) of this species.

Representative specimens:

FLORIDA: Alachua Co.: Gainesville, University of Florida campus, 23 Jul 1979, *Judd 2782* (FLAS); Desoto Co.: 7.8 mi S of Arcadia, 24 Jul 1978, *Shuey 2129* (FLAS); Duval Co.: Jacksonville, off Merrill Road, 7 Aug 1965, *Creager 505* (FLAS); Hillsborough Co.: Tampa Industrial Park ca $\frac{1}{2}$ mi W of 46th St. N of Linebaugh Ave., 24 Jun 1964, *Lakela 25143* (USF); Big Bullfrog Creek ca 6 mi S of Riverview on US 301, 1 Jun 1976, *Wunderlin, et al. 5606* (USF); Jackson Co.: near Neal's Landing, ca 0.5 mi NE of jct. of Fla. 271 and 164, S34, T7N, R8W, 28 Aug 1976, *Gholson 4385* (FLAS); Lake Co.: N of Leesburg, *Baltzell 11201* (FLAS); Manatee Co.: S of Fla. 62 and SE of Duette, 15 Sep 1976, *Shuey 1766* (USF); Pasco Co.: Saint Leo area, 4 Sep 1974, *DuQuesnay s. n.* (FLAS); Pinellas Co.: NW end of Mullet Key, Fort DeSoto Park, 13 Sep 1963, *Thorne 33933* (USF); Polk Co.: near N end of Lake Weohyakapka, 15 Apr 1976, *Willson 1* (FLAS); Seminole Co.: Sanford, S32, T19S, R31E, 18 Jul 1975, *Scudder 952* (FLAS); Sumter Co.: Fla. 471 at the Withlacoochee River, *Baltzell 11214* (FLAS); GEORGIA: Houston Co.: Along Ga. 247-C, 1 mi E of Warner Robins, 7 mi W of I-75, 18 Sep 1980, *Sauleda & Sauleda 4625* (FLAS, USF). NORTH CAROLINA: Cumberland Co.: Methodist College campus lawn, 19 Aug 1968, *Ittenbach 1774* (FLAS); Harnett Co.: Pineview, 4 Oct 1956, *Lanig 481* (FLAS). SOUTH CAROLINA: Lee Co.: 4 mi NNE of Lucknow, 26 Jul 1957, *Radford 27299* (USF).

ACKNOWLEDGEMENTS

We wish to thank Dr. David W. Hall, Extension Botanist, University of Florida, for sharing his information concerning this plant which for years has been known as the "unknown *Portulaca*."

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NEW *ECHEANDIA* (LILIACEAE) FROM MEXICO

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Echeandia was proposed in 1797 by Ortega (Novarum, Aut Rariorum Plantarum . . . Descriptionum Decades, 90, Tab. 18) to differentiate New World plants with connate anthers and retorsely scaled filaments from *Anthericum* of the Old World, which have free anthers and smooth filaments. Subsequently, New World species with fused anthers have been assigned to *Echeandia* whereas those with free anthers, but otherwise indistinguishable from *Echeandia*, were relegated to *Anthericum* or genera subsequently included in *Anthericum*. This resulted in the grouping of quite unrelated taxa. With the exception of *A. panamense* Standl., all of the New World taxa are easily accomodated in two subgenera within a single genus. Because the differences between the New World genus and Old World *Anthericum* are of the same magnitude as those between *Anthericum* and its Old World relatives, the systematic relationships are better displayed by placing New World species in *Echeandia*.

The new species and combinations proposed below are made at this time to accomodate the need for valid names in floristic studies of the Mexican flora.

ECHEANDIA **gracilis** Cruden, sp. nov. (Fig. 1, 4).

Radicitubera juxta cormum, 1–2.5 cm longa; scapi 13–74 cm alti, plerumque minus quam 50 cm alti; folia basalia plerumque minus 25 cm longa, (2–) 4–13 mm lata; tepala crocea, 9.5–12 mm longa, interiora 5–7 mm lata, exteriora 1.5–3 mm lata; filamenta squamosa, 3.5–5.5 mm longa; antherae connatae, 3–5.5 mm longae, diametro ad apicem antherarum plus quam $\frac{1}{2}$ diametro ad insertiones filamentorum; capsula oblonga, 10–12 mm longa, 5–6 mm lata; chromosomatum numerus n = 8 (*Cruden 1172, 1753, 1788, 1889*).

TYPE: MEXICO. MEXICO: Ruta 190, K 59, ca 2.5 km W of Río Frío, pine woods with *Penstemon, Geranium, Castilleja, Cirsium*, ca 3060 m, 10 Aug 1970, *Cruden 1753* (HOLOTYPE: UC; ISOTYPES: ENCB, GH, K, MEXU, MO, NY, US).

Additional specimens examined: MEXICO. DISTRITO FEDERAL: Estación La Cima, Serrania del Ajusco, Delegación de Tlalpan, 3000 m, 20 Aug 1965, *Sanchez G, s. n.* (ENCB); 16 Aug 1964, *Martínez s. n.* (ENCB); *Rzedowski 18665* (ENCB); SE slope Cerro Pelado, 1–2 km NNW Estación La Cima, 3050-3300 m, 13 Jul 1960, *Iltis, Koeppen, & Iltis 183* (WIS); 12 mi S Tlalpan, 10 000 ft, 16 Aug 1953, *Manning & Manning 531031* (GH); Ruta 95 (Libre), K 35-36, ca 10 km N of Morelos, ca 2910 m, 28 Jul 1969, *Cruden 1654* (F, GH, K, MEXU, UC, WIS); Ruta 95 (Cuota), K 36, ca 1 km N Morelos, ca 3120 m, 22 Jul 1968, *Cruden 1401* (UC); 12 Aug 1966, *Cruden 1172* (ASU, ENCB, F, GH, K, MEXU, MO, NY, TEX, UC, US); Parres to Milpa Alta, 30 Jun 1940, *Miranda 497* (MEXU). MEXICO: Ruta 190 (Cuota), K

SIDA 9(2): 139–146. 1981.

Fig. 1. *Echendia gracilis* Cruden. From the type collection (*Cruden 1753*). X 0.36.

47-48, below mirador, 2700 m, 23 Aug 1971, *Cruden 1889* (ENCB, F, GH, K, MEXU, UC, US); Amecameca, 2500 m, 9 Aug 1964, *Cota 45* (ENCB); W of Río Frío, 10,300 ft, 1 Aug 1953, *Manning & Manning 53683* (GH, MEXU, TEX). MORELOS: Ruta 95 (Libre), ca K 49, 3 km S of Distrito Federal, 2880 m, 20 Aug 1970, *Cruden 1788* (ENCB, GH, K, MICH, MO, NY, UC); Toro, 9800 ft, 5 Aug 1924, *Fischer 168* (US, WIS); 6 km N Tres Cumbres, 10,200 ft, 13 Aug 1950, *Lyons 125* (MICH); 2 mi SW Tres Cumbres, 26 Jul 1947, *Barkley, Webster, & Powell 7377* (TEX); Tres Marías, 23 Aug 1910, *Orcutt 3741* (F, GH, K, MO, US); PUEBLA: 6.5 mi E Tlachichuca on rd to Pico Orizaba, 2740 m, 22 Jul 1972, *Denton 1846* (MICH); Rincón Quelite, between San Salvador el Seco and Alchichica, 2390 m, 28 Jul 1967, *Rosas R. 481* (MEXU); Mt. Orizaba, 10,000 ft, 5 Aug 1891, *Seaton 180* (F, GH, US).

This slender species is encountered in the zacatone and adjacent open pine forest of Morelos and the Federal District east to Volcán Orizaba. It is distinguished from the following by the shorter, generally unbranched flowering scapes, fewer, shorter and narrower leaves, shorter root-tubers, and smaller flowers with short, slightly tapered anthers.

ECHEANDIA **mexicana** Cruden, sp. nov. (Fig. 2, 4).

Radicitubera juxta cormum, 1.5–5 cm longa; scapi 32–115 cm alti, plerumque plus quam 50 cm alti; nodi florentes 6–20, internodiis infimis plerumque minus quam 5 cm longis; folia basalia (18-) 30–64 cm longa, (3.5-) 6–15 (-24) mm lata; tepala crocea, 12–17.5 mm longa, interiora 5–8 mm lata, exteriora 2–3 mm lata; pedicelli floriferi 7–11 mm longi, fructiferi 9–22 mm longi; filamenta squamosa, clavata, 4.5–8 mm longa antherae connatae, (5-) 6–8 (-9) mm longae, diametro ad apicem antherarum minus quam $\frac{1}{2}$ diametro ad insertiones filamentorum; capsula oblonga, 9–16 mm longa, 4–5.5 mm lata; chromosomatum numerus n = 8 (*Cruden 1495, 1665, 1711, 1754, 1804, 1888, 2119*) et n = 16 (*Cruden 1232, 1978, 1985*).

TYPE: MEXICO. JALISCO: Ruta 110, K 55, ca 6.5 km SW Mazamitla, ca 2280 m, pine woods with *Tigridia, Cosmos, Salvia, Calliandra,* 15 Sep 1973, *Cruden 2073* (HOLOTYPE: UC; ISOTYPES: ENCB, GH, K).

Additional specimens examined: MEXICO. CHIHUAHUA: Sierra Canelo, Río Mayo, 1 Oct 1935, *Gentry 1891* (GH, NA, UC, US). DISTRITO FEDERAL: Cerro Estrella, 1 km S Ixtapalpa, 2350 m, 4 Aug 1970, *Magana 204* (ENCB); 4 km E Ajusco, 2750 m, 16 Aug 1964, *Hidalgo 102* (ENCB); S San Antonio Tecomitál, 2300 m, 30 Aug 1964, *Villegas D. 469* (ENCB); nr Cerro Conejo, ENE Ajusco, 2750 m, 23 Jul 1967, *Lopez G. s. n.* (ENCB); Pedregal, Valley of Mexico, 1 Sep 1936, *MacDaniels 759* (F); San Angel, 16 Aug 1929, *Mexia 2731* (UC); E Cerro Zacatepec, 15 Jul 1951, *Rzedowski 315* (ENCB); Vallée de Mexico, Santa Fé, 6 Jul 1865-66, *Bourgeau 413* (GH, K). GUANAJUATO: Ruta 101, ca 23.5 km NE Guanajuato, ca 2350 m, 23 Aug 1970, *Cruden 1807* (ENCB, F, GH, K, MEXU, MICH, MO, UC, WIS); rd E from San Miguel Allende, 1 km W Queretaro, ca 2180 m, 23 Aug 1970, *Cruden 1804* (ENCB, F, GH, K, MEXU, TEX, UC, US). JALISCO: Cerro Gordo, above San Ignacio, ca 12 mi SE Tepatitlán, 2200-2500 m, 29 Aug 1958, *McVaugh 17497* (MICH); Ruta 110, K 46-47, ca 1 km NE Mazamitla, 2230 m, 29 Aug 1966, *Cruden 1232* (F, GH, K, MEXU, TEX, UC); K 45-46, ca 2.5 km NE Mazamitla, ca 2250 m, 14 Sep 1971, *Cruden 1985* (ENCB, F, GH, K, UC); Sierra del Halo, SSW Tecalitlán, 2000-2100 m, 28-30 Nov 1959, *McVaugh & Koelz 1166* (MICH); Sierra del Tigre, 3 mi S Mazamitla, 2100-2200 m, 10 Nov 1959, *McVaugh & Koelz 458* (MICH); 16 Sep 1952, *McVaugh 12959* (MICH). MEXICO: Ruta 190 (Quota). K 20, E Ayotla, ca 2240 m, 23 Aug 1971, *Cruden 1888* (ENCB, GH, K, MEXU, UC,

Fig. 2. *Echeandia mexicana* Cruden. *Cruden 1985*, Jalisco, 2.5 km NE Mazamitla. X 0.40.

WIS); Ruta 130, ca K 51, SW Toluca, 2180 m, 25 Sep 1973, *Cruden 2119* (ENCB, GH, K, UC); 1 km NE Tenango del Aire, 2400 m, 11 Aug 1968, *Pineda R. 455* (ENCB); E Cerro del Pino, nr Ayotla, 2600 m, 13 Jul 1967, *Rzedowski 23938* (ENCB); 2 km SE San Francisco Chimalpa, Municipio de Naucalpan, 2600 m, 3 Sep 1967, *Cárdenas 86* (ENCB); 1 km NE San Antonio, Municipio de Amecameca, 2550 m, 31 Oct 1968, *Rzedowski 26422* (ENCB); Zitácuaro to El Aguila, Dist. Valle de Bravo, 2400 m, 11 Oct 1938, *Hinton et al. 13355* (ARIZ, GH, K, MICH, NY, US); Cumbre to Gavia, Dist. Sultepec, 7 Oct 1935, *Hinton et al. 8397* (ARIZ, NY, US); Sultepec, 2400 m, 2 Nov 1952, *Matuda et al. 27750* (MEXU); Molino, 19 Aug 1936, *MacDaniels 534* (F). MICHOACAN: Ruta 15, K 288-289, ca 15 km E Morelia, ca 2120 m, 30 Jul 1969, *Cruden 1665* (F, GH, K, MEXU, NY, UC); rd to Volcán Parícutin, nr Capácuaro, 4 Nov 1958, *Jones 22678* (WIS); 10 mi E Morelia, 7 Jul 1947, *Sauer 1103* (UC); Sierra Torricillas, Dist. Coalcomán, 4 Oct 1939, *Hinton et al. 15255* (ARIZ, GH, NA, NY, US); Cerro Azul, 2200 m, 1910 *Arsène 6032* (GH, MO); above Lago de Pátzcuaro, between Comanja and Quiroga, 6-16 Oct 1962, *Weber & Charette 11851* (MICH); Ruta 15, ca 2 km SE Comanja, 10 Aug 1968, *Cruden 1495* (ENCB, GH, K, MO, UC); ca 18°45' N, 102°56' W, nearly W of Aguililla, 2000-2100 m, 18 Sep 1958, *McVaugh 17868* (MICH); Tancítaro, Dist. Uruapan, 2250 m, 22 Oct 1940, *Hinton et al. 15560* (ARIZ, GH, NY, US); Ruta 37: 29 mi S Ruta 15, 2260 m, 6 Oct 1966, *Anderson & Laskowski 3889* (ENCB, MICH); K 45, 17 km SW Cherán, ca 2520 m, 13 Sep 1971, *Cruden 1978* (ENCB, GH, K, UC); E San Juan Nuevo, ca 8 km S Uruapan, ca 6100 ft, 11-15 Oct 1961, *King & Soderstrom 4749* (MICH, NY, UC, US); 6 mi N Uruapan, rd to Carapan, 1900 m, 20 Aug 1975, *Davidse & Davidse 9885* (MO). MORELOS: Ruta 95 (Cuota), K 60-61, E Coajomulco, ca 2350 m, 28 Sep 1974, *Cruden 2175* (ENCB, F, GH, K, MEXU, MICH, UC, US); Coajomulco, 4 km S Tres Marías, 25 Aug 1967, *Salinas S. 164* (ENCB). PUEBLA: SE slope Popocatépetl, W. Metepec, ca 2520 m, 31 Aug 1962, *Ugent, Ugent & Flores C. 1320* (WIS); 10.5 km NW Atenca, rd from San Salvador el Seco to Ciudad Serdán, ca 2350 m, 28 Jul 1970, *Cruden 1711* (ENCB, F, GH, K, MEXU, MICH, MO, NY, TEX, UC, WIS); W of San Martín Texmelucan toward Río Frío, 6000-8000 ft, 1 Aug 1953, *Manning & Manning 53693* (GH); Ruta 190, K 82-83, ca 2.5 km W San Lucas el Grande (at edge of Sta. Anita), ca 2350 m, 10 Aug 1970, *Cruden 1754* (ENCB, F, GH, K, MEXU, MO, NY, UC, WIS).

This species is widely distributed in the Sierra Madre Occidental and Sierra Volcánica Transversal generally between 1900 and 2500 m in the pine-oak zone from Chihuahua southeast to Michoacán and east into Guanajuato and Puebla. It may be confused with *E. longipedicellata* a species of higher elevations. The latter has fewer flower bearing nodes, the distances between the nodes are greater, and the pedicels, either in flower and/or in fruit are usually longer. Depauperate specimens of *E. mexicana* resemble *E. gracilis* but the anthers of the latter are not strongly tapered. Specimens lacking root-tubers may be confused with *E. reflexa* (Cav.) Rose, whose tubers develop some distance from the corm. The latter species generally occurs at lower elevations in the area of geographical sympatry.

ECHEANDIA **longipedicellata** Cruden, sp. nov. (Fig. 3, 4)

Radicitubera juxta cormum, 2–4 cm longa; scapi 36–100 cm alti; nodi florentes 2–5(-9), internodiis infimis plerumque plus quam 5 cm longis; folia basalia (22-)30–73 cm longa, (5-)6–12(-15) mm lata; tepala crocea, 12–21 mm longa,

Fig. 3. *Echeandia longipediceliata* Cruden. From the type collection (*Cruden 1828*). X 0.36.

Fig. 4. From left to right, flowers of *E. gracilis* (*Cruden 1753*), *E. mexicana* (*Cruden 1978*), and *E. longipedicellata* (*Cruden 1828*), respectively. X 1.0.

interiora 6.5–7 mm lata, exteriora 3–4 mm lata; pedicelli floriferi 14–29(-43) mm longi, fructiferi 22–30(-45) mm longi; filamenta squamosa, 6–12 mm longa; antherae connatae, 6–9 mm longae; chromosomatum numerus n = 40 (*Cruden 1387, 1597, 1702, 1746, 1828*).

TYPE: MEXICO. DURANGO: Ruta 40, K 161-162, ca 38 km E of El Palmito, in disturbed pine-oak-madrone woods, with *Viola, Tigridia, Salvia, Eryngium*, and *Penstemon*, ca 2550 m, 27 Aug 1970, *Cruden 1828* (HOLOTYPE: UC; ISOTYPES: ENCB, F, GH, K).

Additional specimens examined: GUATEMALA. HUEHUETENANGO: rd to Todos Santos Cuchumatán, ca 1.1 km from Ruta Nacional 9, ca 3300 m, 30 Jun 1969, *Cruden 1586* (ENCB, F, GH, K, MO, UC, WIS). MEXICO. CHIAPAS: Ruta 190, mountain ridges ca 14 km SE San Cristóbal de las Casas, 3000–3070 m, 20 Aug 1966, *Cruden 1202* (ENCB, UC); 10 km SE San Cristóbal de las Casas, 2275-2700 m, 31 Aug 1971, *Cruden 1926* (UC). DISTRSTO FEDERAL: Eslava, 1 Oct 1938, *Lyonnet 2860* (US); 4 km E Ajusco, 2750 m, 23 Jul 1967, *Aquirre Z. 41* (ENCB); base of Cerro Xitle, ca 8500 ft, 13 Sep 1930, *Russell & Souviron 172* (US). DURANGO: Ruta 40, ca 38 km E El Palmito, ca 2550 m, 13 Aug 1968, *Cruden 1513* (UC); Ruta 40, ca 29 km W El Salto, 2775 m, 25 Aug 1973, *Cruden 2046* (K, MEXU, UC). GUERRERO: 4.6 mi SW Gral. Nicolas Bravo, 58 km SW Ruta 95, ca 2485 m, 6 Aug 1970, *Cruden 1746* (GH, K, MEXU, UC); slope of Cerro Teotepec, 3400–3600 m, 22 Jul 1969, *Cruden 1633A* (ENCB, F, GH, K, UC); ca 5.2 km SW Gral. Nicholas Bravo, ca 59 km SW Ruta 95, ca 2425 m, 24 Jul 1969, *Cruden 1643* (ENCB, UC) MEXICO: Ruta 130, 45–50 km SW Toluca, ca 2700 m, 25 Sep 1973, *Cruden 2120* (ENCB, F, GH, K, MEXU, MO, UC, US). MORELOS: rd to Lagos de Zempoala, 11–12 km W Ruta 95, ca 2800 m, 28 Jul 1969, *Cruden 1656* (ENCB, K, UC); 20 Aug 1970, *Cruden 1970* (GH, MEXU). OAXACA: Ruta 175, nr Campimento Río Molino, S of Oaxaca, ca 2200, 28 Jul

1968, *Cruden 1436* (ENCB, UC); 21 Sep 1965, *Rzedowski 20990* (ENCB); nr Cerro San Felipe, ca 17 km N Ruta 175, ca 2970 m, 8 Jul 1969, *Cruden 1597* (ENCB, F, GH, F, GH, K, MEXU, MO, NY, UC, US); Ruta 175, ca 79 km NE Oaxaca, Llano de las Flores, ca 2790 m, 15 Jul 1968, *Cruden 1387* (MEXU, UC); vicinity of Cerro San Felipe, 9500–11,000 ft, 1894, *Nelson 1056* (US). SINALOA: Ruta 40, K 206-207, 7-8 km SW Durango, ca 1950 m, 6 Sep 1974, *Cruden 2148* (GH, K, MEXU, UC); 4 mi W El Palmito, 26 Aug 1961, *Powell & Edmondson 932* (MICH). VERACRUZ: Ruta 131, K 21-22, S. Altotonga, ca 2060 m, 27 Jul 1970, *Cruden 1702* (ENCB, GH, K, UC); Ocotepec, Municipio de Jalacingo, 1860 m, 18 Aug 1971, *Ventura A. 4098* (ENCB).

This species is found primarily in pine and pine-oak forest from Durango to Guatamala between 2200 and 3000 meters. It generally occurs at higher elevations than *E. mexicana* and in the latters absence is found at lower elevations.

The following new combinations are proposed.

ECHEANDIA **durangensis** (Greenman) Cruden, comb. nov.

Anthericum durangense Greenman. Proc. Amer. Acad. 39: 72. 1903. TYPE: MEXICO. DURANGO: near El Salto, 8000–8700 ft, 12 Jul 1898, *Nelson 4544* (HOLOTYPE: US; ISOTYPES: GH, NY).

ECHEANDIA **flavescens** (Schultes & Schultes *fil.*) Cruden, comb. nov.

Anthericum flavescens Schultes & Schultes *fil.* Roemer and Schultes, Systema Vegetabilium 7: 1692 (1830). TYPE: MEXICO: *Karowinski 1646* (M).

ECHEANDIA **nana** (Baker) Cruden, comb. nov.

Anthericum flavescens Schultes & Schultes *fil.* Roemer and Schultes, Systema Vegetabilium 7: 1692 (1830). TYPE: MEXICO: *Karowinski 1646* (M).

ECHEANDIA **scabrella** (Bentham) Cruden, comb. nov.

Phalangium scabrellum Bentham. Plantae Hartwegianae, 293–4 (1848). TYPE: MEXICO: *Hartweg 1622* (K). The specimen from Kew bears only the inscriptions: Hartweg (in ink) and 1622 (in pencil). Bentham gave Langos as the type loyalty, undoubtedly the city in the northeast corner of Jalisco.

The opportunity to examine material from the following herbaria is greatly appreciated: ARIZ, ENCB, F, GH, K, M, MEXU, MICH, MO, NA, NY, TEX, UC, US, WIS. My thanks to Kenneth G. Jensen for the preparation of the figures. John Crossett and an unidentified reviewer improved the Latin diagnoses.

MIKANIA (COMPOSITAE) OF THE UNITED STATES

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ABSTRACT

The very large, mainly tropical American genus *Mikania* is represented in the United States by three species, none of which are endemic. These include *M. scandens* of much of the eastern United States, *M. batataefolia* of southern peninsular Florida, and *M. cordifolia* of Florida, Mississippi, and Louisiana.

Mikania (Compositae-Eupatorieae) is primarily a tropical American genus of perennial twiners with nearly 400 known species. The genus is poorly represented in temperate North America. There has never been a comprehensive taxonomic treatment of the three species known to occur in the United States. Numerous floristic works, such as Fernald (1950), Radford et al (1968), Steyermark (1963), Correll and Johnston (1970), etc. include one species, *M. scandens*, for limited areas. Several works treat all known United States species of the genus. These include Small's (1933) account in his Flora of the Southeast United States, now outdated in view of increased botanical activity during the past 50 years. Long and Lakela (1971) include all United States species in their work, but only for "tropical" Florida. Cronquist (1980) presents an account of the genus that differs somewhat from that presented here. The present paper is intended to provide a taxonomic treatment of the three species of *Mikania* in the United States. It is part of a continuing effort to produce a monograph of the entire genus.

This treatment is based upon examination of over 10,000 herbarium specimens of United States species and of closely related species from throughout the world. Examination of foreign collections was necessary to obtain a better perspective on the morphological variation within the genus and to compare the United States species with the same and similar species from both the Old and New Worlds. The author is grateful to the curators of the following herbaria for their loan of material: BM, BR, F, FLAS, FSU, IBE, K, L, LAF, MICH, MISS, MISSA, MO, NATC, NO, NLU, NY, P, PH, RB, SMU, TEX (including LL), UC, US, VDB, and WIS. In the following treatment, synonomy for the genus and for *M. cordifolia* is in an abbreviated form and includes only the names that have been used for the United States plants. Extensive synonomy is available in Holmes and McDaniel (1981). The generic description applies only to the three species treated in this work.

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MIKANIA Willd., Sp. Pl. 3: 1742. 1803.

Willoughbya Neck. ex. Kuntze, Rev. Gen. Pl. 371. 1891.
Willughbaeya Neck., Elem. 1: 82. 1790, *nom. nud.*

Herbaceous to semi-woody twining perennials; stems terete to hexagonal. Leaves opposite, petiolate, simple, entire or toothed, palmately nerved. Capitulescence a simple or compound corymb. Heads homogamous, four flowered. Phyllaries four, equal, linear-lanceolate to narrowly ovate, subtended by a bracteole; receptacle small, naked, glabrous. Corolla white or pinkish to purple tinted, tubular, the tube slender, the throat gradually or suddenly enlarged; teeth of the limb five, equal, deltoid to triangular, shorter than the throat, but exceeding the throat in *Mikania cordifolia*. Anthers basally rounded, the terminal appendage ovate or oblong. Style branches elongated, filiform. Achenes pentagonal, prismatic or tapering downward. Pappus bristles capillary, numerous, free, uniseriate, the margins scabrid, white or pinkish to purple.

TYPE SPECIES: *Mikania scandens* (L.) Willd. (*Eupatorium scandens* L.). Name and type conserved.

KEY TO SPECIES

1. Heads 7–10 mm long; phyllaries 6–8 mm long; corolla teeth slightly longer than the length of the throat; achenes 3–4 mm long; stems prominently hexagonal ..... *M. cordifolia*
1. Heads 4–7 mm long; phyllaries 3–6 mm long; corolla teeth ca one-half the length of the throat; achenes 1.5–2.2 mm long; stems terete to obscurely hexagonal 2
   2. Phyllaries linear-lanceolate, 5–6 mm long; corolla, phyllaries, and pappus usually pinkish to purplish; corolla 3.5–4 mm long; leaves membranous, the apices long tapering ..... *M. scandens*
   2. Phyllaries lanceolate to narrowly ovate, 3–4 mm long; corolla white, phyllaries green, pappus bristles white; corolla ca 3 mm long; leaves subcoriaccous to somewhat fleshy, the apices acute to acuminate ..... *M. batataefolia*

MIKANIA BATATAEFOLIA DC., Prodr. 5: 197. 1836.

Mikania tamoides DC., 1. c.
Willughbaeya heterophylla Small, Fl. Southeastern U. S. 1170. 1903.

Stems somewhat hexagonal to quadrangular to slightly winged, often densely glandular, glabrous to puberulent; internodes 3.5–13 cm long. Leaves deltoid-ovate, 1.5–6 cm long, 1–5 cm wide, subcoriaceous to somewhat fleshy, 3–5 nerved from the base, the veinlets obscure; margins conspicuously and usually hastately toothed to somewhat lobed to repand, the lobes few, wide, divergent; apices acute to acuminate; bases cordate to subcordate; surfaces mostly glabrous, glandular; petiole 1–4 cm long, glabrous, glandular. Capitulescence a corymb, 2–4 cm long, 2–6 cm in diameter, borne on long peduncles; branchlets angular, glabrous to puberulent; pedicels 1–4 mm long, angular, glabrous to puberulent. Heads 4–5 mm long; bracteole linear, ca 2.5 mm long, puberulent, apex acute to acuminate. Phyllaries lanceolate to

narrowly ovate, 3–4 mm long, puberulent; apices rounded to acute to acuminate. Corollas ca 3 mm long, white, glandular; tube ca 1.5 mm long; throat 1–1.1 mm long; teeth deltoid, ca 0.4 mm long. Achenes 1.5–2 mm long; densely glandular, brown. Pappus bristles ca 40, white, ca 3 mm long. Chromosome number unknown. (Fig. 1).

Woodlands, savannahs, salt marshes, swamps, usually in coral soil or oolite; flowering all year; southern peninsular Florida, the Bahamas, and Cuba (Fig. 2).

TYPE: CUBA *A. de la Ossa s.n.* (G-DC, not seen).

There has been some confusion as to the correct status of *Mikania batataefolia*. Small (1933), Robinson (1934), and Long and Lakela (1963) recognized this species in their respective works. However, Alain (1963) referred *M. batataefolia* to *M. micrantha* HBK., a very common and widespread plant of the wet American tropics. Cronquist (1980) merges *M. batataefolia* with *M. scandens*. I believe the plant is amply distinct, especially when examined in extensive series over its entire distribution area, and that it should not be merged with either *M. scandens* or *M. micrantha*. It lacks the pink to purplish coloration of the corolla, phyllaries, and pappus bristles, large capitulescence, and long tapering apices of the phyllaries and leaves of *M. scandens*. The heads of *M. batataefolia* are consistently shorter than those of *M. scandens*. Although similar in head size and characters of the phyllaries to *M. micrantha*, it lacks the large open capitulescence and thin, ovate, non-glandular leaves of that species.

Chemical evidence also supports the distinctiveness of *Mikania batataefolia*. Herz et al (1970) isolated five germacranolides from *M. scandens*: (1) mikanolide, (2) desoxymikanolide, (3) dihydromikanolide, (4) miscandenin, and (5) scandenolide. Only 1 and 3 are found in *M. batataefolia* (Herz et al, 1969). The flavone batatifolin was also reported in *M. batataefolia* by Herz et al (1969). This flavone is not known from *M. scandens*.

MIKANIA CORDIFOLIA (L. f.) Willd., Sp. Pl. 3: 1746. 1803.

Cacalia cordifolia L. f., Suppl. Pl. 351. 1781.
Willoughbya cordifolia (Willd.) Kuntze, Rev. Gen. Pl. 372. 1891.
Willughbaeya halei Small, Fl. S. E. U. S. 1170. 1903.

Stems hexagonal, gray-tomentulose to tomentose; internodes 5–20 cm long. Leaves ovate to deltate, 5–10 cm long, 3–8 cm wide, 3–5(7) nerved from the base; margins subentire to undulate-dentate; apices acute to acuminate; bases cordate with a wide and open sinus; surfaces densely pilose to tomentose, pale green; petioles 2–5.5 cm long, slightly winged, densely pilose to tomentose; opposite petioles connected by a transverse ridge possessing small, laciniate, stipule-like appendages. Capitulescence a compound corymb, terminal and lateral, to 6 cm or more long and 7 cm or more wide; branchlets hexagonal, densely pilose to tomentose; pedicels 0.5–3

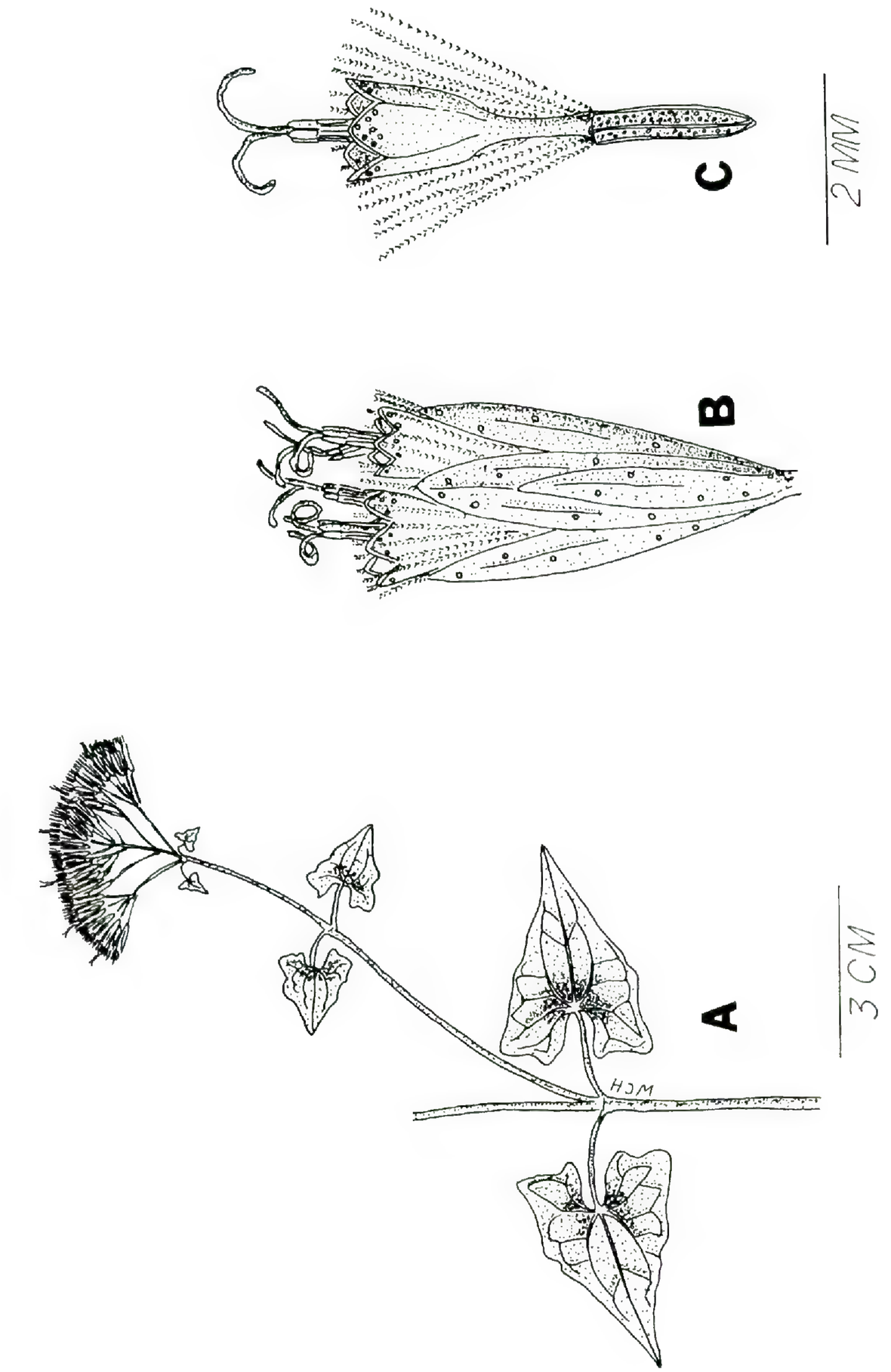

Fig. 1. *Mikania batataefolia* DC. A. Habit, B. Head, C. Flower [after *McDaniel & Brennan 9094* (NATC)].

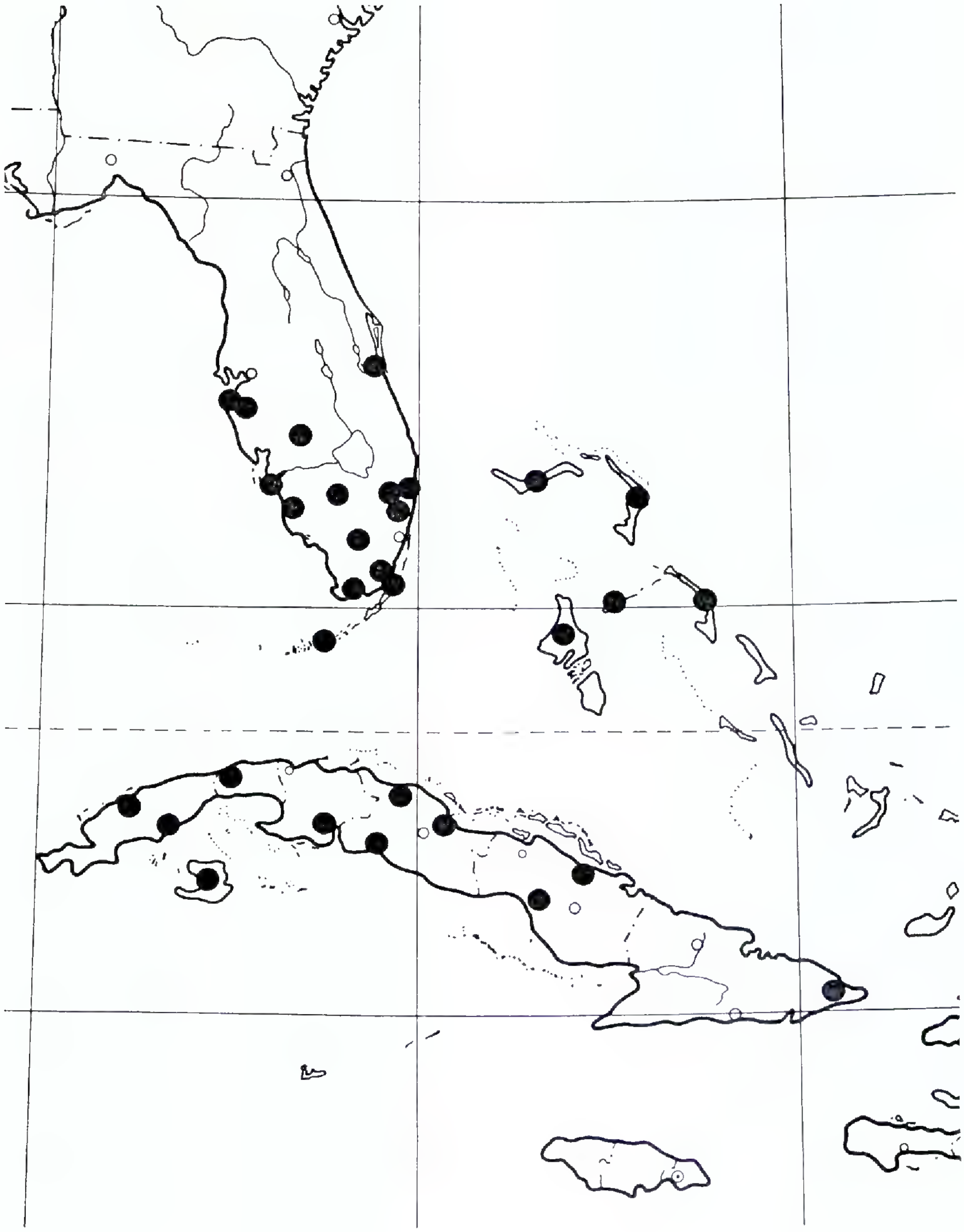

Fig. 2. Documented distribution of *Mikania batataefolia* in southern Florida, Cuba, and the Bahamas.

mm long, hexagonal, pilose to tomentose. Heads 7–10 mm long; bracteole linear to narrowly lanceolate, 4–5 mm long, densely pilose, apex acuminate. Phyllaries elliptic to narrowly ovate, 6–8 mm long, sub-stramineous, apices acute to slightly rounded. Corollas 5–5.5 mm long, white; tube 1.5–2 mm long; throat 1–1.3 mm long; teeth linear, slightly exceeding the length of the throat, recurved when dried. Achenes 3–4 mm long, glabrous to pubescent, lightly glandular, brown. Pappus bristles white ca 60, 5–6 mm long, gradually thinning toward the apices. Chromosome number: n = 18, ca 19 (Powell & King, 1969); 2n = 38 (Gaisner, 1954). (Fig. 3).

Wet areas and woodlands, frequently in calcareous soils; flowering September to December; all of wet-tropical and warm-temperate America from northern Argentina to the Gulf Coastal Plain of the United States (Fig. 4).

TYPE: COLUMBIA, *Mutis 1818* (HOLOTYPE: not seen; ISOTYPE: US!).

Mikania cordifolia is one of the best known and most widespread species of the genus. The species has long been known from southern Florida, but is noticeably absent from Small's (1903) treatment under the synonym *Willughbaeya*. In the same work, the species referred to as *W. halei* Small appears to be *Mikania cordifolia*. The brief description calls for a species with heads slightly larger than *W. scandens* (= *M. scandens*) and occurring in Louisiana. A possible type is *Hale s.n.* (GH!), collected in 1845, the exact location in Louisiana unspecified.

The distribution of *Mikania cordifolia* in the United States appears to be somewhat disjunct (Fig. 4). The species occurs farther inland than previously recorded and its known distribution suggests that it should also occur in western Florida, southern Alabama, and possibly southern Georgia. Coulter (1892) included *M. cordifolia* in his Botany of West Texas, giving its distribution as "from western Louisiana into Mexico," but no specimens from Texas have been located. When its distribution in Louisiana is considered [in one instance scarcely five miles from the Texas border in De Soto Parish (*Thomas 68387 et al* (NLU!))], it certainly is to be expected in eastern Texas.

Of interest are three specimens of *Mikania cordifolia* collected in New Jersey in 1875: *Smith s.n.*, *Buck s.n.*, and *Buck & Eckfeldt s.n.* (all PH!). All are in the flowering state and appear normal in all respects. These appear to have been introduced from seeds present in ballast in the Navy Ballast Yard at Kargins Point. Apparently the species was not persistent in New Jersey since no further records are known to exist.

MIKANIA SCANDENS (L.) Willd., Sp. Pl. 3: 1743. 1803.

Eupatorium scandens L., Sp. Pl. 2: 836. 1753.
Mikania pubescens Muhl., Cat. Pl. Am. Sept. 71. 1813.
M. menisperma DC., Prodr. 5: 200. 1836.
M. scandens (L.) Willd. var. *pubescens* (Muhl.) T. & G., Fl. N. Am. 2. 91. 1843.
Willoughbya scandens (Willd.) Kuntze, Rev. Gen. 372. 1891.
Willughbaeya scandens (L.) Kuntze, of Small, FL. S. E. U. S. 1170. 1903.

Stems obscurely hexagonal to terete, nearly glabrous to densely pilose; nodes provided with narrow, laciniate, stipule-like enations; internodes 8–15 cm long. Leaves triangular to triangular-ovate, 3–15 cm long, 2–11 cm wide, 3–5 nerved from the bases; margins subentire to undulate, crenate or coarsely

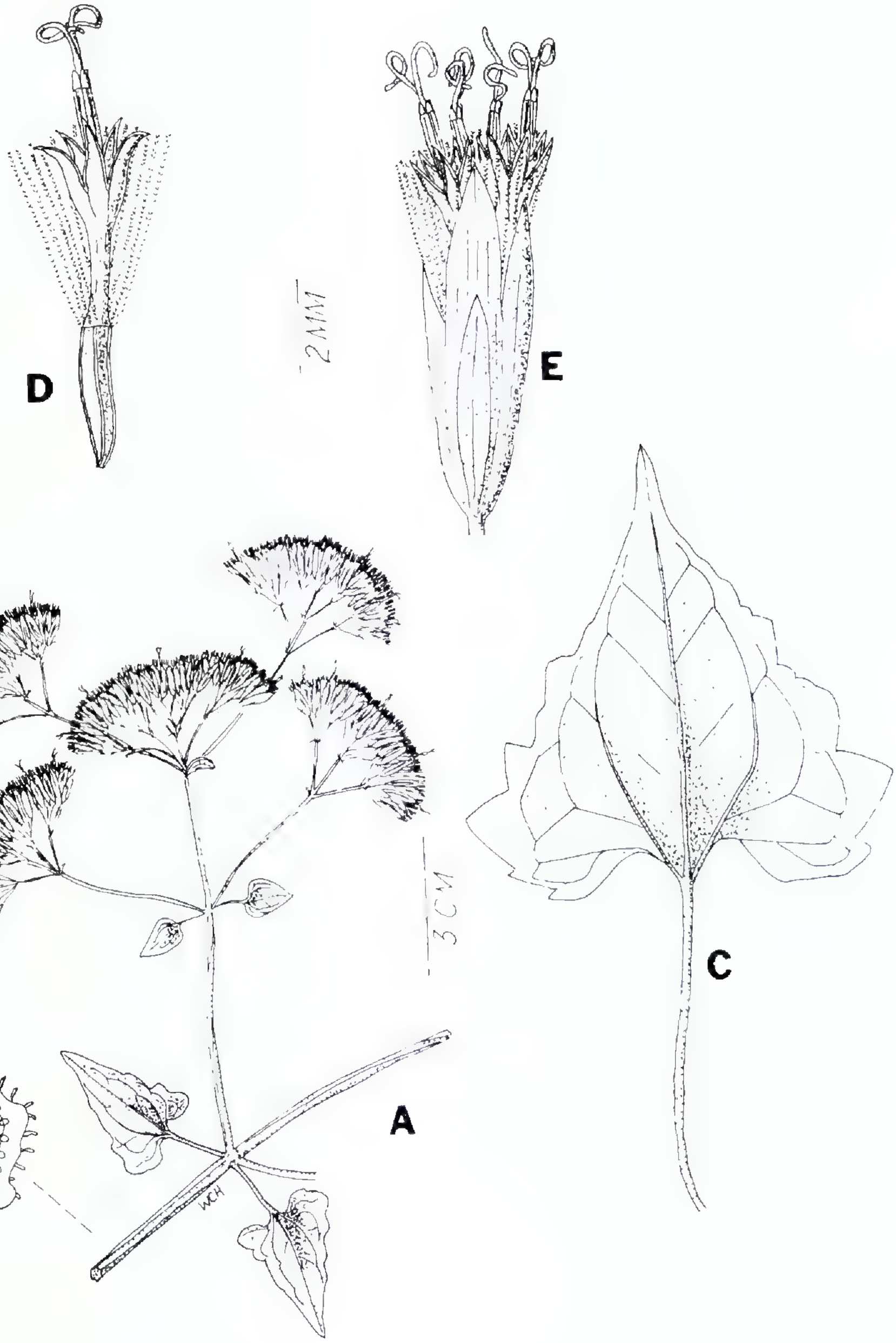

Fig. 3. *Mikania cordifolia* (L. f.) Willd. A. Habit, B. X-section of stem, C. Leaf, D. Flower, E. Head [after *Reese 6804* (LAF)].

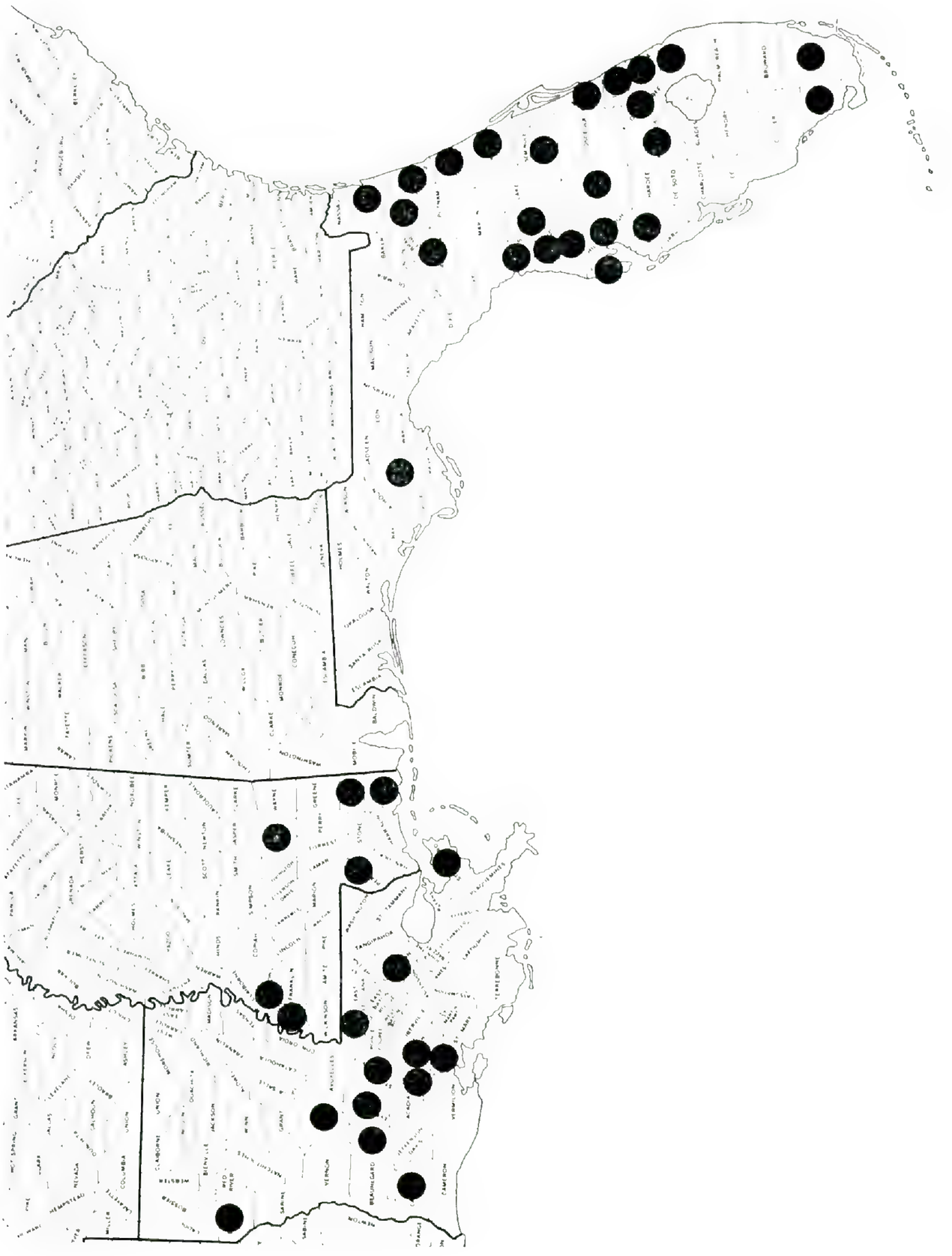

Fig. 4. Documented distribution of *Mikania cordifolia* in southeastern United States.

dentate; apices attenuate, often ending in a caudate tip; bases cordate to hastate, the sinuses wide; surfaces glabrous to puberulent; petioles 2–5 cm long, thin, glabrous to puberulent. Capitulescence a round-topped, rather dense corymb, 2–5 cm long, 2–8 cm in diameter; branchlets angular, obscurely ribbed, glabrous to puberulent; pedicels 2–5 mm long, glabrate to puberulent. Heads 6–7 mm long; bracteole linear to lanceolate, 3–4 mm long, glabrous to puberulent, apex attenuate. Phyllaries linear-lanceolate, 5–6 mm long, glabrous to puberulent, green to pinkish to purplish, apices attenuate. Corollas 3.5–4 mm long, white to more often pinkish to purplish, lightly glandular; tube 1.5–2 mm long, throat campanulate to salverform, 1.3–1.5 mm long, teeth triangular to deltoid, 0.5–0.7 mm long. Achenes 1.8–2.2 mm long, densely glandular, dark brown to blackish, the angles smooth. Pappus bristles 30–37, white to pinkish to purplish, 4–4.5 mm long. Chromosome number: $2n = 38$ (Gaisner, 1954). (Fig. 5).

Wet, mostly open areas; flowering July to December; Atlantic and Gulf coastal plain from Texas to southern Massachusetts, interior along the Mississippi embayment to Missouri and Illinois; also local in the interior in New York and Indiana; rarely in the Bahamas (New Providence) and northern Mexico (Matamoras) (Fig. 6).

Prior to the work of Robinson (1934), *Mikania scandens* was considered a highly polymorphic species of pantropical and temperate American distribution. Robinson largely confined this species to the United States, referring the Old World and tropical material to commonly unused names. Occasionally the name is still used to refer to some of the Old World species, such as in Humbert (1960). Persistent misapplication of the name *M. scandens* to refer to the Old World *Mikania* has caused an incorrect chromosome number of $n = 18$ to be reported for the species. Mangenot and Mangenot's (1957) count of *M. scandens* from Africa could be any of several species. Baquar (1967-68) also reported this number for *M. scandens* of East Pakistan. This count probably applies to *M. micrantha* HBK., a species widely introduced in that part of the world.

A modern treatment of the *Mikania scandens* complex is presented in Holmes (1975).

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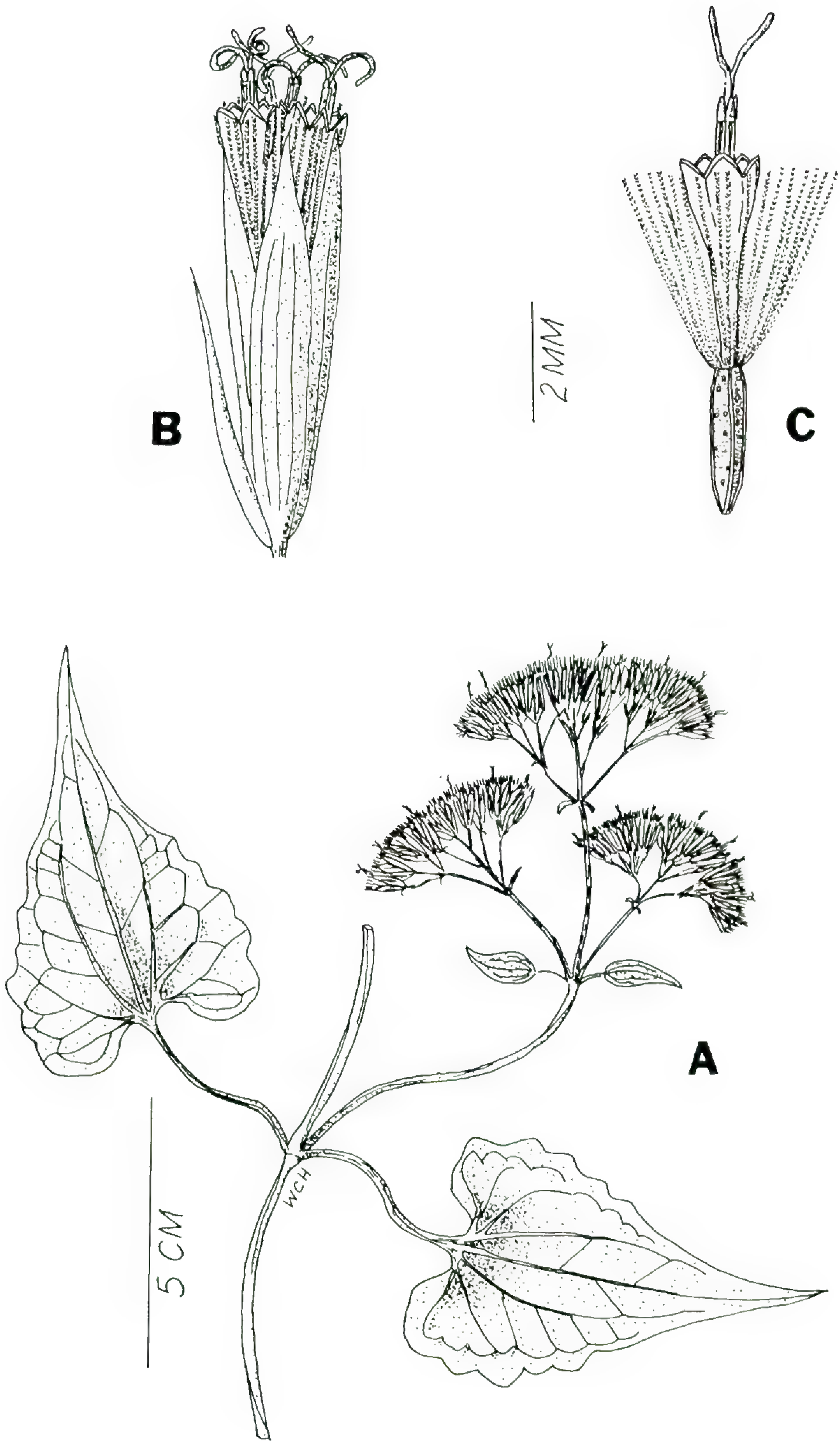

Fig. 5. *Mikania scandens* (L.) Willd. A. Habit, B. Head, C. Flower [after *Holmes 2841* (NATC)].

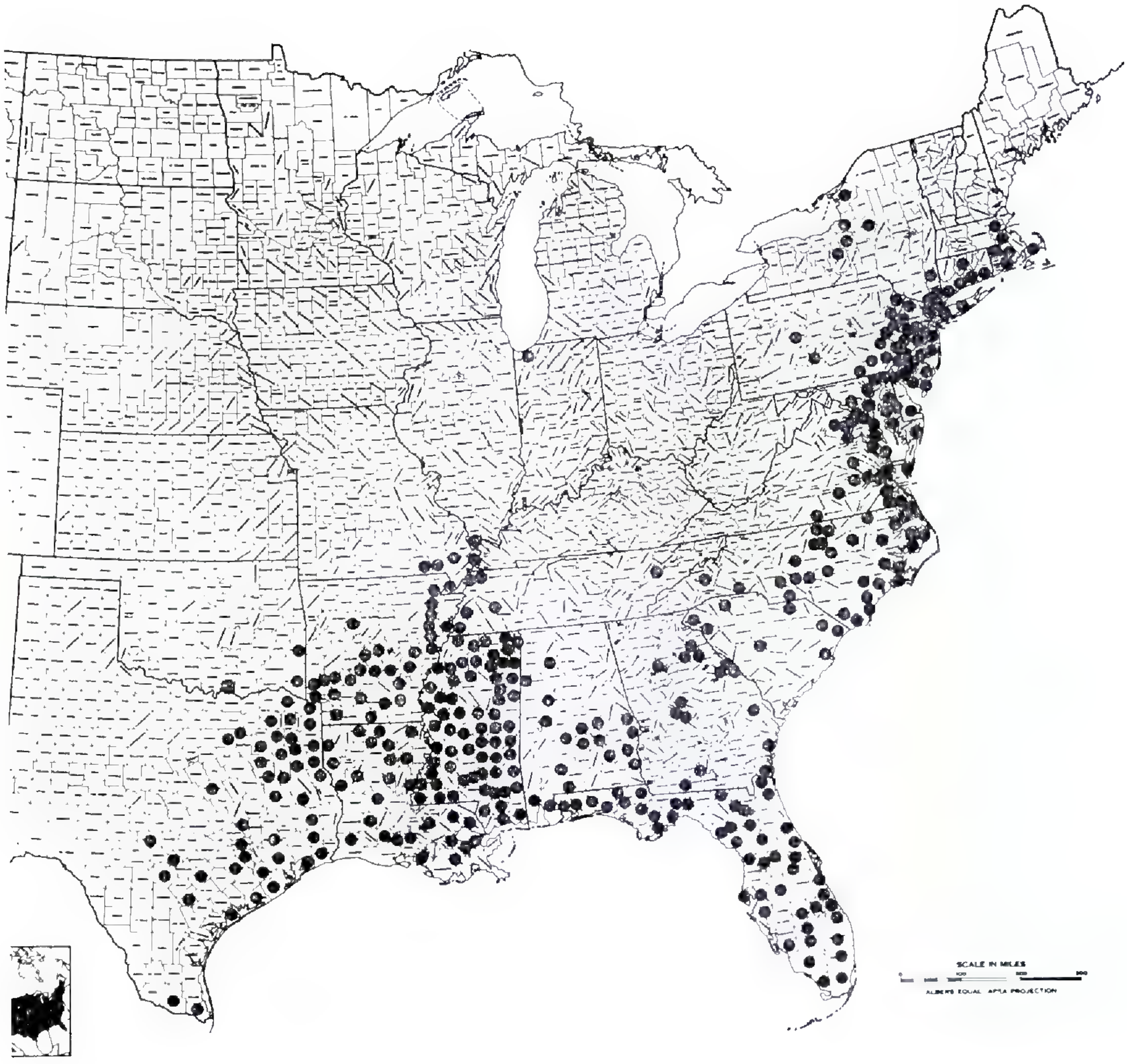

Fig. 6. Documentcd distribution of *Mikania scandens* in eastern United States.

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TAXONOMIC NOTES ON NEW TAXA OF *CLITORIA JAVITENSIS* (LEGUMINOSAE) AND THE EXCLUSION OF VAR. *GLABRA* SAGOT[1]

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In preparation for a mongraphic treatment of the genus *Clitoria*, I have examined and annotated nearly eight thousand herbarium sheets. A major problematic group is the widespread neotropical complex which bears the name *Clitoria javitensis* Benth.

Clitoria javitensis (HBK) Benth. is a widespread neotropical species placed in subgenus *Bractearia* (Mart. ex Benth.) Fantz section *Cauliflorae* Fantz. Members of section *Cauliflorae* are characterized as lianas or occasionally erect shrubs bearing inflorescences that are racemose, nodose, axillary and cauliflorous; bracteoles that are narrow and usually shorter than the calyx; and legumes that are flat and contained suborbicular, thickened seeds (Fantz, 1979).

Historically botanists have misidentified numerous specimens of the species in section *Cauliflorae*. Frequent citation of these specimens in floristic treatments has resulted in nomenclatural confusion. These mistakes were compounded by later botanists utilizing these earlier works. Floristic treatment of any species of liana in the genus *Clitoria* must be accepted cautiously. The range of the given species may not fall within the geographical boundaries of the flora. The taxonomic description may not agree with the named used, or may be a "hybrid" description of two or more species. Furthermore, specimens cited may not belong to the name of the species used.

Three names commonly are used for this group of species. First, the name *Clitoria arborescens* Ait. (it correctly should be *C. arborescens* R. Brown in Ait.) was applied to any woody climber that lacked the broad bracteoles that are subequal to the calyx, and often obscure it. The name *C. arborescens* was the earliest name available for a species of liana. Therefore, it has been misapplied repeatedly to a large number of collections. The species has been reported from a number of countries in which it is now known to be outside of its range. Second, the name *C. javitensis* became more popular after Bentham (1858) noted that *C. arborescens* had leaves

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that were tomentose below, whereas *C. javitensis* had leaves that were glabrate, with scattered appressed trichomes below. Third, the name *Clitoria leptostachya* Benth. was applied to any species of liana with an elongated inflorescence.

Clitoria javitensis is easily recognized from all other members of section *Cauliflorae* by its large fruits (18–24 cm long x 1.8–2.5 cm wide), bearing a dense pubescence of appressed to suberect, rufus trichomes, lacking the uncinate trichomes found on the fruits and calices of other species, and the elongated claw of the vexillum (18–27 mm). This species is native from the western Amazon Basin north into Central America, including Peru, Columbia, western Brazil and Venezuela, and Panama.

Clitoria arborescens is distinguished from *C. javitensis* by smaller flowers (4–6 cm) with a shorter calyx tube (12–17 mm) and longer bracteoles (10–15 mm), leaves tomentose below, and a shorter stipitate-legume (stipe 14–20 mm). This species is native from French Guiana to eastern Venezuela, with an occasional isolated collection from Colombia or northern Venezuela. This species has been cultivated, and the isolated collections may have represented this introduction.

Clitoria leptostachya is distinguished from *C. javitensis* by a narrower and shorter legume (13–18 cm long x 1.2–5 cm wide), a calyx conspicuously uncinate-pubescent (vidi 20-30X) with few subappressed macrotrichomes, a smaller flower (4.5–6 cm) with a style longer than the ovary, and bearing elongate inflorescences (10–70 cm). This species is native to forests of Guyana and eastern Amazonas to western Pará, Brazil.

HISTORY OF CLITORIA JAVITENSIS

The species was originally described under the name *Neurocarpum javitense* HBK in 1824. The description of the species was detailed, and included vegetative and floral structures. Fruits were not observed. One collection was cited as "credit in ripa fluminis Tuamini, prope Javitam (Missiones del Rio Negro)" without collectors noted. The type specimen was collected by *Humbolt & Bonpland* near Yavita in Amazonas, Venezuela, and is deposited at Paris (P).

Bentham (1858) revised the genus *Clitoria*, including *Neurocarpum* in synonymy. He transferred the species *Neurocarpum javitense* to *Clitoria*, citing several additional specimens, which when examined, would broaden the concept of the species. These specimens were *Spruce 1877* and *2320* from northern Brazil, and *Rob. Schomburgk 1000* and *Rich. Schomburgk 1723* of British Guiana.

Sagot (1882) described a new variety, *C. javitensis* var. *glabra*, based upon his collection, *Sagot 120*, from French Guiana.

In the mid 1920's, N. E. Brown annotated several of the Kew sheets from Bentham's herbarium and concluded (as indicated by his annotations on these sheets) that most of the specimens cited by Bentham were distinct

from each other. He referred to them as distinct species, but never gave them a name. No record of any publication by Brown of his observations has been found.

Sandwith (1931) summarized his observations of the leaves, calyx, and bracteoles of the type of *C. javitensis* (P), making comparisons with the specimens in Bentham's herbarium. He selected *Spruce s.n.*, Hb. Bentham and Hb. Hooker, San Carlos, Venezuela, 1853, as the one specimen which best agrees with the type at Paris. He noted that *Spruce 2320* has material from two different collections mounted on the same sheet. He further noted that *Ducke 23406* agreed well with *Spruce 1877* which was observed to have longer bracteoles and calyx teeth. Sandwith concluded that *C. javitensis* was highly variable in length and position of the bracteoles, in the size of the calyx, corolla, and leaves, and in the leaf pubescence. Sandwith recognized two basic groups, which he treated as varieties. The typical variety included *Humboldt & Bonpland* (type), *Spruce 1877*, *Ducke 23406*, and *Spruce 2320* (in part). His second group was *C. javitensis* var. *glabra* Sagot, which included *Sagot 120* (type), *Schomburgk 1000*, *Schomburgk 1723*, and *Spruce 2320* (in part), plus the additional collections: British Guiana —*Hitchcock 17309*, *Gleason 543* and *713*, *Jenman 4930* and *2498*, *Sandwith 599*; Venezuela—*Spruce 3543*.

Specimens I examined and annotated: *Spruce s.n.*, San Carlos, 1853 (K-Hb. Bentham), *Spruce 1877* (K-Hb. Bentham), *Spruce 2320* (K), *Spruce 3543* (CGE, G, GH, F, K, RB, W), *Schomburgk 1000* (BM, CGE, W), *Schomburgk 1000/1723* (K), *Sagot 120* (GH, K, NY, S, U, W), *Ducke 23406* (G, K, RB, S, US), *Hitchcock 17309* (GH, NY, S, US), *Gleason 543* (GH, NY) and *714* (GH, NY), *Jenman 4930* (K), and *Sandwith 599* (K, NY, RB).

Based upon the identifications of uncited specimens which I have examined, it is apparent that most botanists have accepted Sandwith's treatment.

The type specimen of *C. javitensis* has not been seen by this author as it was not included in the loan from Paris. An attempt was made in 1975 to obtain this particular specimen, or a photograph of it, but the specimen could not be located at the Herbarium of the Museum d'Histoire Naturelle (P). I have obtained a concept of the type of *C. javitensis* from three main sources. First, the original description by Humbolt, Bonpland, and Kunth (1824) was very detailed. Second, Sandwith (1931) noted that *Spruce s.n.*, San Carlos, Venezuela, Aug 1853 (K!) was the best match to the Paris type. In addition, *Spruce 2320* (K!) bears his annotation notes which indicate that the indumentum of the calyx and vexillum, bracteoles size, and general appearance of the calyx "agree well with those of the type of *C. javitensis* at Paris." Since this specimen contains mixed material, it should be noted that Sandwith's annotations refer to the specimen mounted on the left side of the herbarium sheet. Third, I have examined numerous specimens labeled *C. javitensis* near the type locality.

REVISED CONCEPT OF CLITORIA JAVITENSIS

Based upon the evidence examined during this study, I reject the broad concept of *C. javitensis* as viewed by Sandwith, agreeing more closely with the conclusions of N. E. Brown. Sandwith's concept of *C. javitensis* contained a mixture of morphologically variable plants that can be segregated into distinct groups by both morphological characters and geographical distribution. The concept of *C. javitensis* in this treatment has been emended to exclude *C. javitensis* var. *glabra* Sagot. In addition, two new names, *Clitoria portobellensis* Beurl. and *Clitoria grandifolia* Ducke, have been placed in synonymy.

Most of the specimens cited by Sandwith, as well as the type of *C. javitensis* var. *glabra* Sagot belong to a species described in *Clitoria sagotii* Fantz, SIDA, Contr. Bot. 8(1):9. 1979. The use of Sagot's epithet as the specific epithet was rejected because of probable confusion with *Clitoria glabberrima* Pitt. found in the same subgenus. *Clitoria sagotii* is easily distinguished from *C. javitensis* by the raised midrib on the upper leaf surface, the uncinate pubescence of the calyx, vexillum, and legume, the smaller flowers, and the subsessile inflorescences. A morphological comparison between *C. javitensis* and *C. sagotii* (synonym: *C. javitensis* var. *glabra* Sagot) is provided in Table 1. *Clitoria sagotii* includes the cited specimens of *Sagot 120*, *Schomburgk 1000*, *Schomburgk 1000/1723*, *Gleason 543* and *714*, *Hitchcock 17309*, *Jenman 4930*, *Sandwith 599*, *Spruce 3543*, and *Spruce 2320-B*. *Spruce 2320* is a mixed collection separated on the herbarium sheet by pencil lines, and annotated with notes in pencil by Brown and Sandwith. The branch bearing leaves mounted on the left side of the sheet, the branch bearing flowers mounted on the right side of the sheet, and the packet of loose flowers were labeled "A" by Fantz, and represent *C. javitensis*. The branch bearing leaves in the center of the sheet plus the individual mounted flower were labeled "B" by Fantz, and represent *C. sagotii*. *Spruce 1877* and *Ducke 23406* represent another new species which will be described in a succeeding paper.

The revised concept of *C. javitensis* is described as follows:

CLITORIA JAVITENSIS (H.B.K.) Benth., Journ. Linn. Soc. 2:42. 1858. *emend.* Fantz (TYPE: prope Javitam, Missiones del Rio Negro, *Humbolt & Bonpland s.n.*, P).

Neurocarpum javitense H.B.K., Nov Gen. Sp. 6:409. 1823. (TYPE: Javitam, *Humbolt & Bonpland s.n.*, P).

Clitoria grandifolia Ducke, Arch. Jard. Bot. Rio de Jan. 5:141. 1930. (LECTOTYPE: *Ducke 20399*, RB).

Clitoria portobellensis Beurl., Kingl Vetenskaps Acad. Handl. p. 119, 1854. (LECTOTYPE: Porto-Bello, 1826, *Billberg s.n.*, S-hb. Regnell).

Ternatea javitensis (H.B.K.) Kuntze, Rev. Gen. Pl. 1:210. 1891. (TYPE: Javitam, *Humbolt & Bonpland s.n.*, P).

Table 1. A comparison of some vegetative and reproductive differences of *C. javitensis* (HBK) Benth. and *C. sagotii* Fantz

CHARACTER	*C. JAVITENSIS*	*C. SAGOTII*
LEAVES:		
midrib above*	Impressed	Raised
INFLORESCENCE:		
length*	1–6 cm (occ. to 20 cm)	Subsessile to 0.5 cm
pubescence*	rufo-strigose	predominately uncinate
CALYX:		
tube*	17–24 mm	11–16 mm
lobes	4–8 mm	5–8 or 8–13 mm
pubescence*	appressed	uncinate predominately
BRACTEOLES:		
length	2–3 mm or 4–6 mm	4–7 mm or 8–11 mm
insertion	1–2 mm (occ. 2–5 mm)	2–5 mm
VEXILLUM:		
claw*	15–19 mm	6–9 mm
pubescence*	tawny-rufo, appressed	uncinate, few appressed
ALAE:		
beyond carina	8–10 mm	8–13 mm
blade length*	24–30 mm	17–21 mm
CARINA:		
shape*	falcate	nearly straight
claw*	30–38 mm	25–32 mm
FLOWER SIZE:	(5.5) 6–8 mm	5–6 cm (occ. 6–8 cm)
ANDROECIUM:		
tube	(34) 38–49 mm	32–39 mm
free filaments	2–5 mm	4–7 mm
connective*	acute	apiculate
GYNOECIUM:		
ovary length*	17–22 mm	10–14 mm
ovary width*	1.5–1.8 mm	1–1.2 mm
ovary pubescence*	rufus to tawny	white tinged yellow
LEGUME:		
length*	18–24 cm	9–15 cm
width*	18–24 mm	15–18 mm
pubescence*	dense rufo-appressed	uncinate + scattered pilose
stipe	24–33 mm	30–37 mm
dehiscence*	$\frac{1}{4}$ to $\frac{1}{2}$ twist	1–2 twist
SEEDS:		
length*	9–12 mm	6–7 mm
width*	9–10 mm	7–8 mm
thickness	3–4 mm	5 mm
seeds per pod	7–11	4–8

* major difference

Note: Measurements separated by "or" indicate variation at subspecific levels.

Liana, tall, climbing to treetops, or less commonly an erect shrub, 2–4 m tall, polymorphic. Branches 3–9 mm thick, hollow, longitudinally striate to sulcate, terete, juvenile branch pubescence both uncinate and short, rufus, pilose, becoming glabrate; bark dark brown, peeling in longitudinal strips exposing lighter layers beneath. *Leaves* 3-foliate, coriaceous; leaflets variable in shape, size, and pubescence, mainly narrow to broadly elliptic-oblong, occasionally elliptic, lanceolate-elliptic, lanceolate-ovate, ovate, or oval, apex acuminate from an acute to obtuse lamina, acumen 1–3 cm, more or less mucronate, base broadly cuneate to rotund, midrib impressed above, often more or less short pilose, rarely pilose on primary nerves, primary nerves of 9–13 (15) pair, upper surface green to dark green, glabrous, lower surface green, pubescence typically appressed, short, slightly conspicuous, becoming glabrate to glabrous, or occasionally pilose becoming glabrate with the spreading trichomes confined to nerves, lamina 7–18 (23-28) cm long, 3–9 (18) cm wide. Petiole subterete, longitudinally striated to canaliculate, often gradually twisted, 4–17 (25) cm, pubescence uncinate and with rufus, appressed to suberect trichomes, becoming glabrate, rachis 1–4.5 cm. Petiolules subquadrate, 4–9 (10) mm, pubescence uncinate and pilose, rufus. Stipules deciduous, ovate to lanceolate, acute, 3–8 (10) mm long, 1–3 mm wide, pubescence uncinate and appressed, densest towards apex and more or less ciliate; stipels semipersistent, linear to subulate, acute, lateral stipels typically 3–7 mm long, 1–1.5 mm wide, terminal stipels 1–3 (4) mm long, 0.5–1 mm wide. *Inflorescences* axillary, solitary, and cauliflorous, solitary to few-fascicled, several to multi-flowered, racemose, nodose; axes pubescence dense, short-pilose, more or less rufus, axes typically (0.5) 1–5 cm long, occasionally more elongate, 4–18 cm long. Pedicels 4–9 mm, thickened to 3–4 mm in fruit. Bracts ovate, acute to acuminate, spreading to reflexed in age, pubescence uncinate and appressed; middle pair and outer bract persistent, 2–6 mm long, 1–3 mm wide. Bracteoles minute to short, ovate to lanceolate, broadly acute to short-acuminate, 2–6 mm long, 1–3 (4) mm wide, inserted 1–2 mm below calyx base or occasionally subopposite to alternately inserted, 2–5 mm below the calyx, pubescence appressed, more or less ciliolate. *Flowers* resupinate, papilionaceous, large, showy, (5.5) 6–8 cm, various shades of pink to rose, less commonly lilac or lavender to pale violet; veins of vexillum dark pink to red or purplish within; alae and carinas whitish to pale pink to rose. Calyx tinged purple, pubescence appressed, uncinate trichomes lacking, tube (15) 17–24 mm long, 5–10 mm wide at base to 8–13 mm wide at throat, lobes broadly deltoid to ovate, acute to short acuminate, 4–8 mm long, 3–4 mm wide at base, ventral lobe subequal, 5–9 mm long, 1–1.5 mm wide. Vexillum pubescence moderate to dense, appressed, rufus becoming tawny, blade 3.5–5 cm wide, claw 15–19 mm. Alae extended beyond carina 7–10 mm, blade 22–31 mm long, 7–12 mm wide, claw 18–27 mm, uncinate pubescent. Carina falcate, blade 11–18 mm long, 3–6 mm wide, claw 30–38 mm. Staminal tube glabrous, (34) 38–49 mm long, free

filaments 2–5 mm; anthers lanceolate, 1.8–2 mm long, 0.5–0.8 mm wide. Gynophore 5–7 mm, pubescence dense, tawny-rufus; ovary 17–22 mm long, 1.5–1.8 mm wide, pubescence dense, appressed, rufus to tawny; style 16–25 (28) mm long, geniculate 6–9 mm from distal end, pubescence uncinate and densely bearded; stigma subcapitate, ca 0.7–0.9 mm wide. *Legume* long-stipitate, exerted beyond the calyx, flat, green to brown tinged reddish, pendant, weakly raised around seeds, pubescence dense, appressed to sub-erect, rufus, becoming thinned with age; valves 18–24 cm long, 18–25 mm wide; beak when present typically 3–7 mm; dehiscence causing valve to twist one-quarter to one-half of a turn; stipe 2–3 mm thick, (19) 24–37 mm long, pubescence uncinate and stigose to pilose, rufus. Seeds smooth, thick-lenticular, face suborbicular to slightly longer than wide, dark brown to black, 9–12 mm long, 9–10 mm wide, 3–4 mm thick, 7–11 seeds per pod; hilum 2 mm x 1 mm.

Clitoria javitensis is a polymorphic species which exhibits a range of variation in its habit, bracteole insertion below the calyx, and in the size of the leaflets, stipules, petioles, inflorescence, bracts, bracteoles, and calyx lobes. This complex needs further study incorporating field studies and experimental methods. From a morphological viewpoint, certain combinations of characters consistently are found to occur in plants from defined geographic areas. These distinct groups are treated nomenclaturally. They are easily recognized and segregated in a key. Comments on the variation that was observed for each structure will be noted first, followed by comments on combinations of characters which can be found in a geographic region.

The habit of the species is usually reported as a woody vine or liana. Occasionally, the species is an erect shrub 2–4 m tall, or a scandent shrub. Johnston (1949) expanded on the habit of individuals on San Jose Island noting that plants were woody vines in dense forests and erect shrubs in thickets and in more open areas.

The leaves and associated structures are highly variable. Generally, they can be divided into two distinct groups, the "typical leaf" (those which match the type specimen) and the "grandifoliate leaf". The typical leaf is short-petiolate with a short petiolule and smaller sized leaflets. The petiole is usually 4–12 cm long, sometimes elongating to 13–15 cm on larger leaflets. The petiolules are usually 4–6 mm long to rarely 7–8 mm on larger leaflets. The typical leaflet is elliptic to elliptic-oblong or lanceolate-elliptic, 7–18 cm long by 3–7 (9) cm wide. The grandifoliate leaf is long-petiolate, has a longer petiolule, and a larger size leaflet. The petiole is usually 10–20 (25) cm long, even on younger leaves. The petiolule is usually (6) 7–10 mm. The grandifoliate leaflet is usually ovate, ovate-elliptic, to lanceolate-ovate, becoming very broad, 15–28 cm long by 6–15 cm broad. The typical leaf is associated with shorter inflorescences, whereas the grandifoliate leaf is often found on individuals with elongate inflorescences. Exceptions do

occur, particularly in Meta, Colombia and parts of Amazonas, Venezuela where a typical leaf is associated with inflorescences of 6–8 cm, slightly larger than most specimens bearing typical leaves. Occasionally, a collected specimen with mostly typical leaves will exhibit one or two grandifoliate leaves (e.g., Panama). Thus, the leaf type is helpful as a supportive character, but not reliable as the only diagnostic character.

Stipules of individuals found in Central America and much of South America are generally 6–10 mm long. In Amazonas, Venezuela and adjacent areas, the stipules are consistently 3–5 mm long, rarely with a stipule reaching 6 mm. Stipules are deciduous, and not observed on all specimens.

The most common inflorescence is short, (0.5) 1–6 cm long, and few-flowered. Rarely an individual possessed an inflorescence which reached 8 cm long, although inflorescences to 10 cm long were observed in cultivated specimens. The less common inflorescence type was elongated, typically 4–18 cm long, with many flowers. Most collections from Meta, Columbia were intermediate, 4–7 cm long. Pedicels can be used as a supportive character. The short inflorescence type has pedicels commonly 3–7 mm, whereas some individuals may have longer pedicels. The long inflorescence type has pedicels of 6–11 mm.

Bracts are typically minute, 2–3 (4) mm long in South American members. Bracts of members in Central America and adjacent Colombia are commonly 4–6 mm. The bract length refers specifically to the middle pair of bracts which tend to be persistent, are usually the largest, and are concave and subtending the pedicel.

Bracteoles are commonly 4–7 mm long. Specimens from Amazonas, Venezuela and adjacent areas have minute bracteoles, typically 2–3 (4) mm long. In addition, these minute bracteoles are inserted 2–5 mm below the base of the calyx, whereas, most bracteoles are inserted only 1–2 mm below and subtend the base of the calyx.

Calyx lobes are commonly 4–6 mm long, broadly deltoid with the length subequaling the width or to 1.5 x the width at the base of the lobe. The apex is acute or sometimes short-acuminate. In Peru and the western Amazon Basin, the calyx lobes are elongate, the length nearly twice the width, with an acuminate to subulate apex.

The common stipe is 19–37 mm. Specimens with elongated inflorescences bear stipes of 19–24 mm, whereas, those of Central America and adjacent Colombia with shorter inflorescences bear stipes of 24–32 mm and those of other regions of South America with shorter inflorescences bear stipes of 28–37 mm.

A comparison of the patterns of variation and combinations of characters that are associated together suggest four distinct groups, which are treated as varieties. These varieties are summarized in Table 2.

The typical variety, var. *javitensis*, includes the type from Yavita, Venezuela. This group is easily recognized by the minute bracteoles inserted

Table 2. A taxonomic comparison between the varieties of *Clitoria javitensis*.

CHARACTER	*JAVITENSIS*	*PORTOBELLENSIS*	*LONGILOBA*	*GRANDIFOLIA*
INFLORESCENCE	Short	Short	Short	Long
LEAF TYPE	Typical	Typical	Typical	Grandifoliate
PETIOLE	Short	Short	Short	Long
PETIOLULE	Short	Short	Short	Long
STIPULE	Short	Long	Long	Long
BRACTS	Short	Long	Short	Short
BRACTEOLE LENGTH	Short	Long	Medium	Long
BRACTEOLE INSERTION	Subtend or Below 2–5 mm	Subtend	Subtend	Subtend Below 2–5 mm
CALYX LOBES	Short	Short	Long	Long
STIPE	Long	Medium	Unknown	Short

Table 3. A key providing measurements for terms utilized in Table 2.

	Short	*Long*
Inflorescence	(0.5) 1–6 cm	6–18 cm
Petiole	4–10 (14) cm	10–20 (25) cm
Petiolule	4–6 (8) mm	6–10 mm
Stipule	3–5 mm	6–10 mm
Bracts	2–4 mm	4–6 mm
Bracteoles	2–4 mm	4–7 mm
Calyx lobes	4–6 (7) mm	(5) 6–9 mm
Stipe	19–24 mm	28–37 mm
LEAF KEY:	*Typical*	*Grandifoliate*
Leaflet length	7–18 cm	15–28 cm
Leaflet width	3–7 (9) cm	6–15 cm
Basic leaflet shape	Oblong-elliptic	Ovate

well below the calyx, and the short stipules. The inflorescence is short with flowers bearing short calyx lobes. Fruits are long-stipitate. The leaves are of the typical type. Within this variety are a number of plants with a consistently longer bracteole (by 1 mm) which is inserted 1–2 mm below the base of the calyx and subtending it. This group is treated as a form, *C. javitensis* var. *javitensis* f. *bracteosubtenda*. The typical variety is distributed in the central and western Amazon Basin, which includes southern Venezuela and Colombia, and Amazonas, Brazil.

A second variety is easily recognized by its elongate bracts. In addition, the stipules and bracteoles are longer than those in the typical variety, whereas the stipe is shorter. Specimens with this combination of characters are found only from Central America to Antioquia, Colombia. This group includes the type specimen for *Clitoria portobellensis* Beurl. Since most characters of *C. portobellensis* agree with those of *C. javitensis, C. portobellensis* Beurl. is synonymized with *C. javitensis*, and reduced from the level of species to the varietal level as *C. javitensis* var. *portobellensis* (Beurl.) Fantz, a new combination. Leaves of this variety typically are appressed pubescent below as in the typical variety. However, specimens frequently appear which are pilose below, an uncommon pubescent type for the species. These are treated as *f. pilosa*. There also occurs a rare leaflet shape in this group in which the apex is truncate, an apex type which is unknown elsewhere in the subgenus. It rarely occurs in other species, *Clitoria kaessneri* of Africa (subgenus *Clitoria*) and *Clitoria javanica* of Southeast Asia (subgenus *Neurocarpum*). It is treated as f. *truncata*.

A third variety is found only in Peru where the leaves are of the typical shape and the inflorescence is short, but the calyx lobes are conspicuously elongated and subulate. In addition, the stipules and bracteoles are longer than the typical variety. This group is treated as var. *longiloba*.

The last variety is easily recognized by its grandifoliate leaf and elongated inflorescences. In addition, the calyx lobes, stipules, and bracteoles are longer than the typical variety, whereas the stipe is shorter. This group includes the type specimens of *Clitoria grandifolia* Ducke (*Ducke 20399*, RB!, *Ducke 20400*, RB! S! U!, *Kuhlman 1493*, RB! U!). Nearly all the floral characteristics and those of the fruit, except for the stipe, agree with *C. javitensis*. Therefore, *Clitoria grandifolia* Ducke is synonymized with *C. javitensis* and reduced from the level of species to the varietal level as *C. javitensis* var. *grandifolia* (Ducke) Fantz.

NEW TAXA OF CLITORIA JAVITENSIS

1. Clitoria javitensis (HBK) Benth. var. javitensis

Leaflets typically small, 7–18 cm long, 3–7 (9) cm wide. Petiole 4–10 (14) cm. Petiolule 4–6, rarely to 8 mm long. Stipules 3–5 mm. Inflorescences few-flowered, (0.5) 1–6 cm, rarely to 8 cm. Pedicels 3–7 (9) mm. Bracts 2–4 mm. Bracteoles 2–4. Calyx lobes 4–6 (7) mm, length subequal to 1.5 x width, apex acute to short-acuminate. Stipe 28–37 mm.

Type: VENEZUELA. Amazonas: cresit in ripa fluminis Tuamini, prope Javitam [=Yavita], Missiones del Rio Negro, *Humbolt & Bonpland s.n.* (P).

1a. f. *javitensis*

Bracteoles minute, 2–3 mm long, rarely 4 mm, subopposite becoming alternate on the pedicels, inserted 2–5 mm below the base of the calyx, or more or less reaching it.

1b. f. **bracteosubtenda** Fantz, *f. nov.*

Forma nova C. javitensis var. javitensis optimo distinguitur a bracteolis brevior fundo calycis insertis et pedicello sub-oppositis. Bracteolae (2) 3–4 (5) mm longae, calycis subtenda ad 2 mm infra fundo calycis inserta, apex plus minusve ad baso calycis partis strumosi.

TYPE: VENEZUELA. BOLÍVAR: Rió Parguaza, between mouth of El Carmen, 50 km upstream, 80–110 m, 3 Jan 1956, *Wurdack and Monachino 41093* (HOLOTYPE: NY; ISOTYPES: US 2167581 and 2167582, VEN 40651).

The holotype specimen has a number of flowers with bracteoles of different sizes, but all subtending the calyx inserted to nearly 2 mm below the calyx, as is typical of this form.

2. CLITORIA JAVITENSIS (HBK) Benth. var. PORTOBELLENSIS (Beurl.) Fantz, Ann. Mo. Bot. Gard. 67(3):589. 1980.

Clitoria portobellensis Beurl., Kongl. Vetenskaps Acad. Handl. p. 119. 1854.

Leaflets typically small, 7–18 cm long, 3–7 (9) cm wide. Petiole 4–10 (14) cm. Petiolule 4–6 (8) mm. Stipules 6–9 (10) mm. Inflorescences few-flowered, (0.5) 1–6 (8) cm. Pedicels 3–7 (9) mm. Bracts 4–6 mm. Bracteoles 4–7 mm, inserted 1–2 mm below the calyx base, subtending it. Stipe 24–32 mm.

TYPE: PANAMA. In silvis montium, Porto-Bello, Apr 1826, *Billberg s.n.* (LECTOTYPE: S-hb. Regnell!).

Beurling did not select a type specimen. He published the locality as "In silvis montium." The published name was *Clitoria (Vexillaria?) portobellensis* which agreed with the identification of the Billberg specimen deposited in a type folder at Stockholm. The specimen agrees with the published description. Based upon this evidence, the *Billberg s.n.* specimen (S) was selected as the lectotype because it was the probable specimen upon which Beurling described his new species.

2a. f. *portobellensis*

Leaves with pubescence on lower surface appressed, becoming glabrate, trichomes then confined to major nerves, more or less inconspicuous.

2b. f. **pilosa** Fantz, *f. nov.*

Forma nova C. javitensis var. portobellensis optimo distinguitur a foliis cum paginis infermis pilosi.

TYPE: PANAMA. CANAL ZONE: vic. of Gamboa, 20 Dec 1946, *Allen 3931* (HOLOTYPE: G-Hb. Delessert; ISOTYPE: MO 1572352).

2c. f. **truncata** Fantz, *f. nov.*

Forma nova C. javitensis var. portobellensis optimo distinguitur a foliolo obovato cum apex truncato ad truncato-retusi. Foliola 5–8 cm longis, 4.5–5 cm latis, cuneati, infra glabratus, trichomata subappressus ad patenti secus nervalem. Forma rarior.

TYPE: PANAMA CANAL ZONE: Barro Colorado Island, Jan 1939, *Broun 185* (HOLOTYPE: F 1004739).

3. CLITORIA JAVITENSIS (HBK) Benth. var. **longiloba** Fantz, *var. nov.*

Varietas nova *C. javitensis* optimo distinguitur a *lobis calycis elongatis*. Folia infra glabratus ad glabrous, trichomata subappressus parce secus nervalem; foliola 7–14 (19) cm longi, 4.5–9 (12) cm lati. Petioli 3–9 cm, rarior 9–10 cm cum grandifolia. Stipulae decidui, (4) 5–7 mm longi. Inflorescentiae pauciflorentes, 0.5–2 cm longi. Pedicelli 5–7 mm. Bractcae 3–4 mm. Bracteolae 3–4 (5) mm, calycis subtendus et inserta infra 1–2 mm. *Lobi calyces elongati, longitudo fere bis latitudo, apex breviacuminus ad subulatus, (5) 6–8 (9) mm longi.* Stipites incogniti.

TYPE: PERU. LORETO: Stromgebeit de Marãnón von Iquitos aufwarts bis zur Santiago-Mundang am Pongo de Manseriche, ca 77° 30′ W, 1924, *Tessman 3782* (HOLOTYPE: S; ISOTYPES: G-Hb. Delessert) Peru. San Antonio, Marãnón, *Tessman 3782* (PARATYPE: F 612407).

4. CLITORIA JAVITENSIS (HBK) Benth. var. **grandifolia** (Ducke) Fantz, *comb. nov.*

Clitoria grandifolia Ducke, Arch. Jard. Bot. Rio de Jan. 5: 141. 1930.

Leaflets typically grandifoliate, (10) 15–28 cm long, 6–15 cm wide. Petioles 10–25 cm. Petiolule 6–10 mm. Stipules 6–10 mm. Inflorescence elongate, 4–18 cm, multiflowered. Pedicels 5–9 (11) mm. Bracts 3–4 (5) mm. Bracteoles 4–6 mm. Calyx lobes (4) 5–8 mm, ventral lobe 7–12 mm. Stipe 19–24 mm.

TYPES: BRAZIL. AMAZONAS: Tonantins, 8 Nov 1927, *Ducke 20399* (LECTOTYPE: RB-2 sheets.) Brazil. Sao Paulo de Olivenca, 18 Oct 1927, *Ducke 20400* (LECTOPARATYPE: RB-2 sheets). Peru. Iquitos, 26 Feb 1924, *Kuhmann 1493* (LECTOPARATYPE:RB-2 sheets; ISOLECTOPARATYPE: U. *Non S = Canavalia dictyota*).

Ducke cited three collections he had examined from the herbarium at the Jardin Botãnico de Rio de Janeiro. Each collection is mounted on two sheets placed in separate folders. Of these syntypes, *Ducke 20400* lacked the fruits which were described in the original description of *C. grandifolia*, and *Kuhlmann 1493* lacked any mature flowers. *Ducke 20399* has a mature fruit, an inflorescence with many flowers, plus a packet of fruit fragments, one intact flower, and one dissected flower. As the best syntypic specimen which was examined by Ducke and which best matches the published description of *C. grandifolia, Ducke 20399* was selected as the lectotype. The other two specimens cited by Ducke are designated as lectoparatypes.

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ASTER LAEVIS (ASTERACEAE) NEW FOR TEXAS —A SIGNIFICANT RANGE EXTENSION AND A NEW VARIETY

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The occurrence of *Aster leavis* L. in Texas has not been previously reported. Two years ago, four collections were discovered in the herbarium of Sul Ross State University (SRSC), one originally labelled *A. Wootonii* Greene (*B. N. Warnock 10995*), the others among the unidentified asters (*Warnock 12070, 23371,* and *Turner & Warnock 157*). Two sheets, originally marked as "closest to" and later annotated by M. C. Johnston as *A. hesperius* A. Gray, are on deposit in the Lundell collection at the University of Texas Herbarium (LL): *Correll & I. M. Johnston 19156* and *Correll & Correll 26040.* All these plants were collected in the Guadalupe Mountains, Culberson County, Texas, on limestone soil, at elevations between 1,800 and 2,700 meters. They came from stations in and near the McKittrick Canyon.

Aster laevis is a variable species with wide distribution, ranging from Maine westward to British Columbia and southward to Georgia. Previous records from the southwestern United States place the species as far south as Lincoln County, New Mexico. Other collections from that state are from Colfax, Mora, San Miguel, Santa Fe, Taos, and Union counties. Wooton & Standley (1915) list the vegetational zone in which *A. laevis* occurs as "Upper Sonoran and Transition". The occurrence of populations in the Trans-Pecos region of Texas is, therefore, not really surprising, because the topography and vegetation of the Guadalupe Mountains form a natural extension of habitat. However, A. S. Tomb commented that the McKittrick Canyon does not really fit any vegetational zone but rather constitutes a relictual island or refugium noted for the occurrence of many rare, disjunct or endemic, taxa.

The plants at hand resemble more the western var. *geyeri* A. Gray than the typical variety of *A. laevis*, for instance in the narrower, more pointed phyllaries, but they also exhibit some unique characteristics. The basal rosettes are strongly developed with several large, lanceolate, sessile or petiolate, glabrous and glaucous leaves still persistent when the plants are in flower (July through September). In the other varieties of *A. laevis*, as well as in *A. hesperius* (incl. var. *wootonii* Greene), the basal leaves are mostly withered at flowering time. The cauline leaves in this variant are linear-lanceolate, abruptly reduced in size, the larger ones dilated at the

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clasping, sometimes auricled, base. Several of the collections show the bracteate-leaved peduncles which characterize typical *A. laevis*. Heads are relatively large, with bright blue ligules and yellow or somewhat purplish tinged disk florets. Characters of the involucre and receptacle are also typical for the species, especially the presence of minute bristles on the alveolae of the receptacle.

In recognizing the morphological distinctness and the somewhat disjunct range, I am assigning varietal status to the populations of *A. laevis* from the Trans-Pecos region of Texas, as follows.

ASTER LAEVIS L. var. **guadalupensis** A. G. Jones, var. nov.

Characteribus proximus A. laevi *var.* geyeri *A. Gray sed differt; foliis basilaribus per tempora florescentiae persistentibus, sessilibus vel subpetiolatis, lamina lanceolata, caulinibus lineari-lanceolatis abrupte deminutis.*

TYPE: TEXAS. CULBERSON COUNTY: along stream, mouth of McKittrick Canyon, Guadalupe Mountains, 2 Jul 1958, *D. S. Correll & I. M. Johnston 19156* (HOLOTYPE: LL!—Figure 1).

Following is a key distinguishing this new variety from the other two varieties of *A. laevis* mentioned, and from *A hesperius*.

1a. Plants scattered, the rhizomes stout and relatively short; stems and leaves glaucous; basal leaves typically with winged petioles; cauline leaves thick and firm, sessile and conspicuously clasping, more or less abruptly reduced in size, those of the inflorescence branches bracteiform; phyllaries indurate at the broad base, the tips with well-defined rhombic to rhombic-oblanceolate herbaceous zones; alveolae of the receptacle bristly; ligules bright blue; achenes glabrous or nearly so.
  2a. Basal rosette leaves withered at flowering time; plants typically stout.
    3a. Phyllaries strongly imbricated in (3-)4–5 series, the tips acute with broad and short rhombic green zones; plants completely glabrous ..... *A. laevis* L. var. *laevis*
    3b. Phyllaries less strongly imbricated in 3–4 series, broadest at the base, the tips short-attenuate with narrower, rhombic-oblanceolate green zones; upper branches and achenes often slightly pubescent ..... *A. laevis* L. var. *geyeri* A. Gray
  2b. Basal rosette leaves persistent at flowering time; phyllaries as in var. *geyeri*; stems and achenes glabrous; plants comparatively slender ..... *A. laevis* L. var. *guadalupensis* A. G. Jones
1b. Plants colonial with a strongly creeping rhizome system; stems and leaves not glaucous; upper stem portions distinctly pubescent in lines; basal leaves not petiolate, the cauline leaves thin, flexuous, not conspicuously clasping, gradually reduced in size, the inflorescence leafy; phyllaries not indurate, the outer often entirely herbaceous, or the tips with oblanceolate green zones; alveolae not bristly; ligules lavender; achenes distinctly strigillose ..... *A. hesperius* A. Gray

ACKNOWLEDGMENTS

This research has been supported financially by N.S.F. Grant DEB-80-21772. Help received with the Latin diagnosis from Dr. D. P. Rogers is gratefully acknowledged, as is the loan of specimens from SRSC and TEX-LL.

Figure 1. Holotype of *Aster laevis* var. *guadalupensis* (*D. S. Correll & I. M. Johnston 19156*—LL!)

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FIELD STUDIES ON TEXAS ENDEMICS

WM. F. MAHLER

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As a result of continuing field studies (Mahler, 1981) on Taxa Currently Under Review (Fed. Reg., 1980), the following endemic taxa have been determined to be more widespread or more abundant than previously thought and are neither threatened nor endangered. The field research and illustrations were supported by the Office of Endangered Species, U.S. Fish and Wildlife Service, Albuquerque, NM.

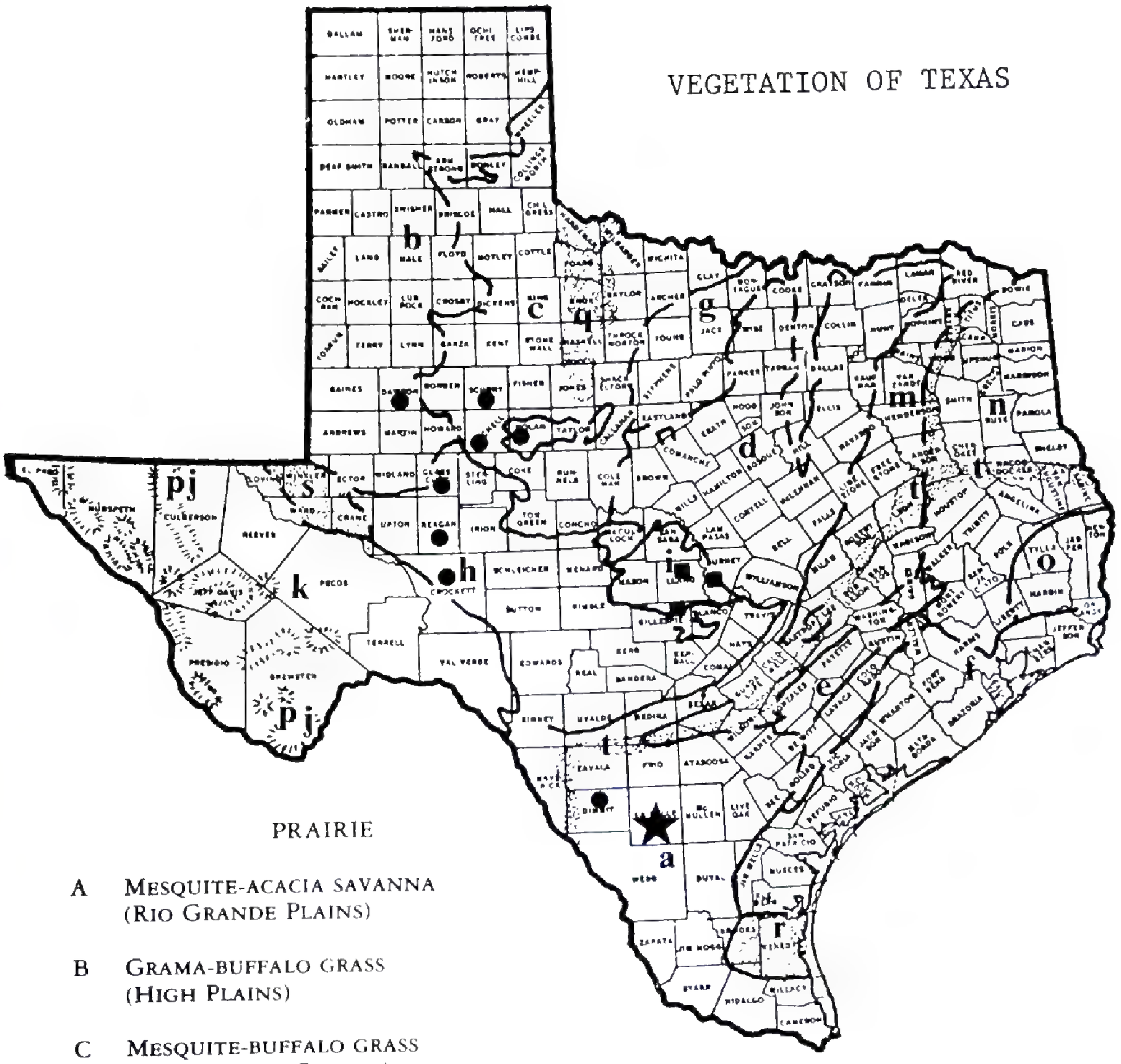
ARGYTHAMNIA ARGYRAEA Cory. Fig. 1, 2. In 1935, Cory and Munz collected the species and in 1937, Parks visited the type locality for additional materials. Cory (1945) described the species from pistillate plants. The staminate plants remained undescribed until Ingram (1957) published a description based upon the Munz collection of 1935. In the Spring of 1981, Toney Keeney (Southwest Texas Junior College) rediscovered the species south of Los Angeles (La Salle County) and currently plants are known north and south of Los Angeles from a ten mile area. The habitat is of the Yegua Formation that extends from north of Los Angeles to south of Highway 359, east of Laredo in Webb County, east of the paralleling Interstate 35. The species is typically dioecious with large staminate plants possessing older central stems with both staminate and pistillate flowers.

SELENIA JONESII Cory. Fig. 1, 3. A series of flowering specimens were collected by Cory in Crockett County in 1929. In 1930, he returned and collected fruiting specimens (Cory, 1931). Marcus E. Jones visited the site with him in 1930 and Cory named the taxon after him in appreciation of his visit to Texas. On my visit to the type locality, Mr. Wm. R. Baggett, Jr., who showed me the area, stated that he remembered Mr. Cory since he had stayed at the ranch. Cory subsequently collected the species in Reagan County (Martin, 1940) and Glasscock County in 1938 and 1942. In 1945, Pohl collected it in Mitchell County and since that time, others have collected it in Dimmit, Dawson, and Scurry counties. During the Spring of 1980 and 1981, I relocated populations in all of the previously reported counties as well as in Nolan County. The Nolan County population was abundant in a plowed field and this endemic has the potential to become a noxious winter annual in agronomic areas.

Fig. 1. Distribution of three Texas endemics: *Argythamnia argyraea*—star; *Selenia jonesii*—circles; *Valerianella texana*—squares.

SIDA 9(2): 176–181. 1981.

VEGETATION OF TEXAS



PRAIRIE

A MESQUITE-ACACIA SAVANNA
(RIO GRANDE PLAINS)

B GRAMA-BUFFALO GRASS
(HIGH PLAINS)

C MESQUITE-BUFFALO GRASS
(ROLLING RED PRAIRIE)

D BLUESTEM-NEEDLEGRASS
(BLACKLAND PRAIRIE)

E BLUESTEM-BUFFALO GRASS
(FAYETTE PRAIRIE)

F BLUESTEM-SACAHUISTA
(GULF COASTAL PRAIRIE)

WOODLAND

G OAK-BLUESTEM
(E & W CROSS TIMBERS)

H JUNIPER-OAK SAVANNA
(EDWARDS PLATEAU)

I MESQUITE-OAK SAVANNA
(LLANO BASIN)

J PINYON-JUNIPER
(TRANS-PECOS MTNS.)

K CREOSOTE BUSH-SHRUB
(TRANS-PECOS BASINS)

FORESTS

M OAK-HICKORY
(E TEXAS)

N OAK-HICKORY-PINE
(E TEXAS)

O BEECH-MAGNOLIA-PINE-OAK-SWEET GUM
(BIG THICKET)

P PINE-DOUGLAS FIR
(TRANS-PECOS MTNS.)

DEEP SAND

Q SHINNERY
(N TEXAS)

R MESQUITE-LIVE OAK SAVANNA
(RIO GRANDE PLAINS)

S SAND DUNES
(S HIGH PLAINS)

T CARRIZO, SPARTA, & QUEEN CITY SANDS

Fig. 2. *Argythamnia argyraea* Cory

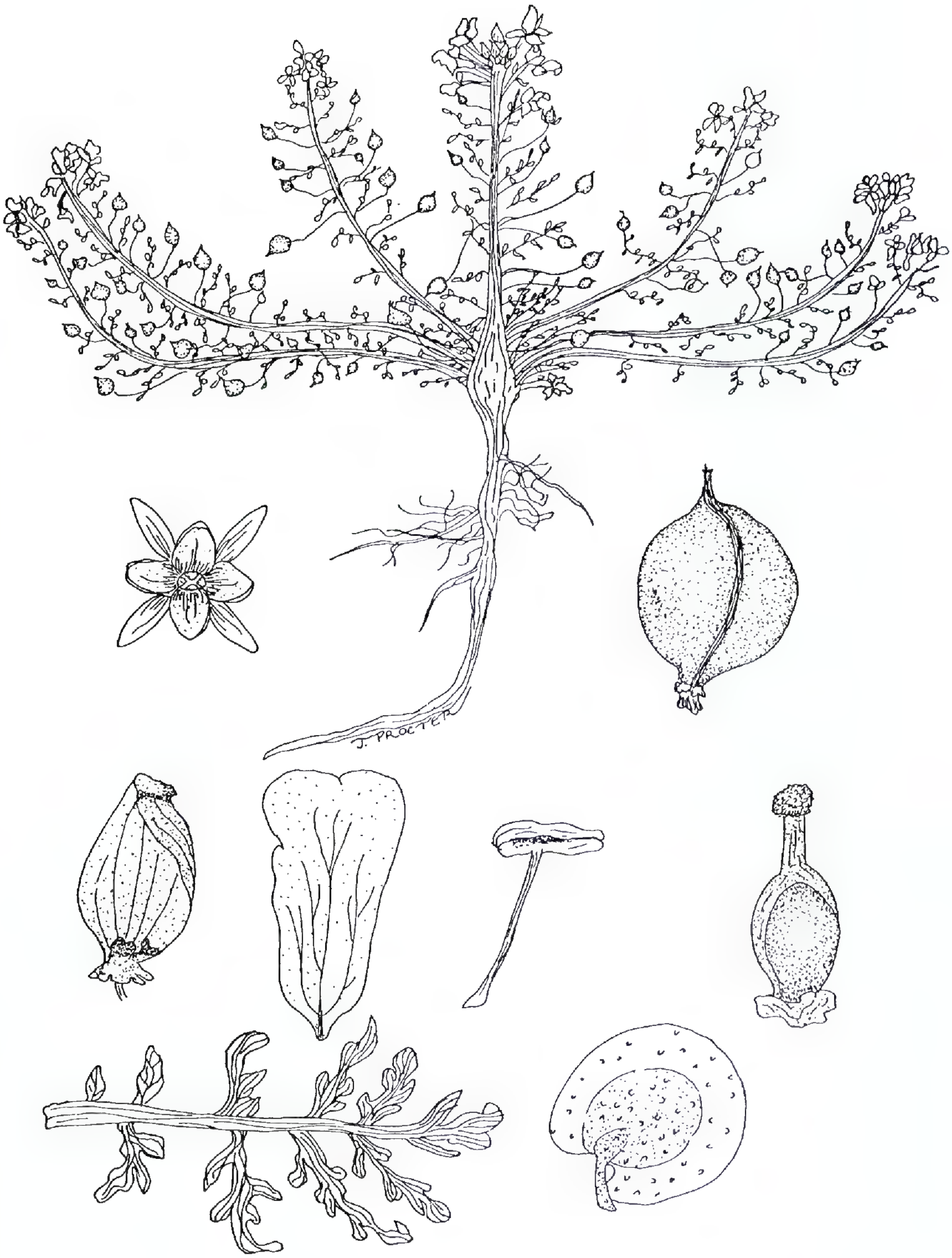


Fig. 3. *Selenia jonesii* Cory

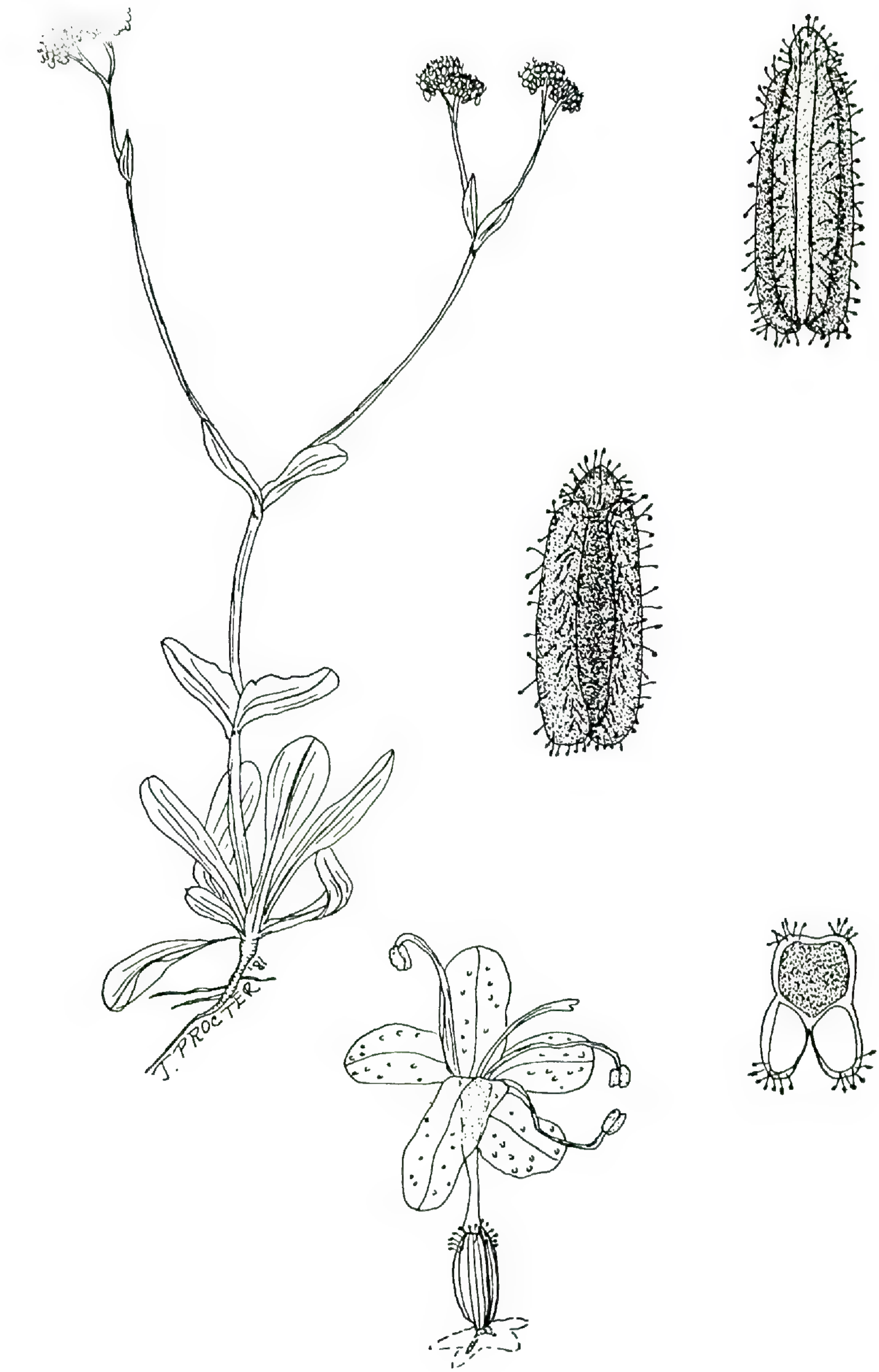


Fig. 4. *Valerianella texana* Dyal

VALERIANELLA TEXANA Dyal. Fig. 1, 4, Gustav Jermy collected the type specimen apparently prior to the Civil War. Dyal (1938) described the taxon, identified as *V. stenocarpa*, and subsequently collected the taxon in Gillespie County. Dyal and Rogers & Webster collected the species in Llano County in 1940 and 1949, respectively. Eggers-Ware and Bangma-Baker collected it in Gillespie County in 1966 and Ware again in 1970 near Buchanan Dam and near Enchanted Rock in Llano County. In the Spring of 1980, I relocated the population near Buchanan Dam. Ware and Baker found two populations in Gillespie County and Ware, Baker, and I mapped the populations in Llano County and extended the range with populations in western Burnet County in 1981, two of which occurred within the boundaries of Inks Lake State Park. This winter annual, endemic to the Llano Basin, is locally abundant on the shallow, granitic soils.

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NOTES

DIDIPLIS DIANDRA (LYTHRACEAE) IN SOUTHEASTERN MEXICO.—*Didiplis diandra* (DC.) Wood., is a small, delicate aquatic plant which frequently flowers totally submerged and is found in shallow, quiet, temporal water. Due to similar leaf shape it can be easily confused on first glance with the genus *Callitriche*.

The importance of this collection in southeastern Mexico lies in the fact that until now *Didiplis* has been considered a monotypic genus endemic to eastern North America (Graham, 1975). It is reported from Texas to Florida in the south to Minnesota and Virginia to the north, although, the herbaria in southeastern United States contain a total of only 12 specimens from Kentucky, Louisiana, Mississippi, North Carolina, and Virginia, according to Graham.

This collection of *Didiplis diandra* was made very near the city of Campeche, in a small logwood swamp (tintal) of *Haematoxylum campechianum*. The plants were completely submerged with the exception of a few smaller individuals which were growing upon very wet soil. They were found in bloom, in both submerged and very wet soil populations. The form of the leaves changed from linear in the submerged plants to narrowly elliptic in the emerged ones. The whole population grew mixed among grasses, which made them very difficult to see.

This first report of *Didiplis diandra* from the state of Campeche shows that the genus is no longer endemic to eastern North America but apparently has a more extensive distribution. However, due to its size and peculiar habitat, it has gone unseen by collectors.

In terms of Mexico, it is worth reiterating that Novelo (1981) mentions the necessity of intensifying the collections of aquatic plants in the south which present elements with origins in the southeastern United States or South America (Lot, et al., 1980), many of which are poorly known or of a limited known distribution.

The voucher specimen for this new report is *A. Novelo 597*, deposited in the National Herbarium (MEXU). The collection was made with the support of project PECNAL-790236 of the PNIE of the CONACyT.—
Alejandro Novelo Retana, Departamento de Botánica, Instituto de Biologia, Universidad Nacional Autónoma de México.

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PHLOX PILOSA L. VAR. **LONGIPILOSA** (WATERFALL) J. & C. TAYLOR COMB. NOV. (POLEMONEACEAE).—Based on *Phlox longipilosa* Waterfall, Rhodora 73: 576–577. 1971. TYPE: U.S.A. OKLAHOMA. Kiowa Co.: northern slopes of granite mountains south of Lake Altus, 29 May 1957, *Waterfall 13134* (HOLOTYPE: OKLA).

Phlox longipilosa is listed as an endangered species by Ayensu and DeFilipps (Endangered and Threatened Plants of the United States, 1978) and as a taxon currently under review for listing on the National List of Endangered or Threatened Species (Federal Register 45(242): 82529. 1980).

In the original description of the species, Waterfall notes that Wherry (The Genus Phlox, 1955) treats this material as *Phlox pilosa* ssp. *latisepala* Wherry, and he deals with the separation of *P. longipilosa* and *P. p.* ssp. at length. However, Wherry actually states that only transitional forms of *latisepala-pilosa* occur west to Mangum in southwestern Oklahoma. He also maps and states that *P. p.* ssp. *riparia* Wherry is disjunct in southwestern Oklahoma and cites Granite as a location. His map of *P. p.* ssp. *pilosa* includes southwestern Oklahoma; and some specimens from the granite area of the Wichita Mts., annotated as such by Wherry, are at OKL. In 1970, Wherry (Castanea 35:198) reports a specimen from Lake Altus as *P. p.* ssp. *fulgida* Wherry, which extended the range of this northern nonglandular variant south and westward into Oklahoma. Based on Wherry (1955, 1970) and Waterfall (1971) there should be 5 taxa of *Phlox* (*P. longipilosa*, and *P. pilosa* ssp. *pilosa*, ssp. *riparia*, ssp. *fulgida*, and ssp *latisepala*) within a 15 mile long area on the granite outcrop in Kiowa and Greer Counties of Oklahoma.

We agree with Waterfall that this southwestern phlox on the granite is a distinct taxon having a unique combination of characters: long, abundant, jointed, pilose hairs on the calyx, leaves, and inflorescence stems; shorter glandular hairs on the inflorescence branches and on the calyx. This plant has linear opposite leaves that become alternate in the inflorescence (rarely all leaves alternate). The numerous stems per plant have congested leaves with short internodes usually 1 to 2 cm. long.

We also agree with Wherry that the granite phlox falls well within the spectrum of variation found in the *Phlox pilosa* complex and appears to us to be most closely related to *P. p.* var *pilosa*. It most likely represents a surviving remnant of *P. p.* var. *pilosa* which became adapted to the granitic soils and remained as a relict when the drying of climate caused the eastward withdrawal of *Phlox* from western Oklahoma.

Based on field work funded by the U. S. Fish and Wildlife Service, and examination of specimens at DUR, MO, OKL, OKLA, and SMU, we have determined there is a single variable taxon occurring on the granite soils of the Wichita Mountains of southwestern Oklahoma and that it is presently

geographically isolated from taxa of the genus *Phlox*. It is restricted to a 15 mile long area at the west end of the Wichita Mountains located in Kiowa and Greer counties, and has not been relocated in Comanche Co. where it was collected once in 1937.—*R. John Taylor and Constance E. S. Taylor, Southeastern Oklahoma State University, Durant, OK 74701.*

ADDITIONS TO THE FLORA OF TENNESSEE—Surveys of aquatic and wetland plants of the Tennessee Valley have resulted in the collection of taxa previously undocumented for Tennessee. These include *Najas gracillima* (A. Br. ex Engelm. in Gray) Magnus, *Cyperus difformis* L., *Eleocharis tortilis* (Link) Schult., and *Hydrocotyle umbellata* L. Collection data and the location of voucher specimens are listed below with some general comments on their ecology and distribution.

NAJAS GRACILLIMA (A. Br. ex Engelm. in Gray) Magnus. Cumberland Co.: abundant in lake at Cumberland State Park near Crossville, 29 Jul 1980, *Dennis & Morgan 2412* (FSU, TENN, VDB); Greene Co.: small pond in the bottom of sink in pasture field on the E side of US 411 near Caney Branch, 2.5 mi SW of where US 411 crosses the Nolichucky River, 11 Aug 1980, *Webb & Price 3259* (FSU, TENN, VDB); Henderson Co.: Pine Lake in Beech River Project near Lexington, 27 Sep 1978, *Fielding 2052* (TENN); Jefferson Co.: Dalton Lake, ca 6 mi E of Danridge, 23 Jul 1970, *Bates s.n.* (TENN). Although this species is reported from Grundy and Hardeman counties by Robinson and Shanks (1959), *N. gracillima* was not attributed to the State in the revisionary study by Haynes (1979). The specimen from Grundy County has been determined to be *N. minor* and no specimen was located at TENN to substantiate the report from Hardeman County. The collections reported here are from a variety of physiographic provinces and document the species to be an element of the Tennessee flora.

CYPERUS DIFFORMIS L. Meigs Co.: mudflats on Hiwassee Island on Chickamauga Reservoir at TRM 500.0; ca 5 mi N of Birchwood, Tn., 28 Oct 1980, *Webb & Murphy 3696* (FSU, TENN, VDB). The distribution of this species has recently been discussed by Lipscomb (1980) who lists the species from four other southeastern states. *Cyperus difformis* is currently widespread along Guntersville and Wheeler Reservoirs in northern Alabama and has expanded its range into eastern Tennessee. Our observations indicate that the drawdown zone along reservoir margins provides an excellent habitat for the species which in some instances becomes "weedy", excluding native taxa.

ELEOCHARIS TORTILIS (Link) Schultes. McNairy Co.: swampy area on the E side of US 45, 3.9 mi N of jct. of US 64 and US 45 (in Selmer) near Bethel Springs, 20 Jun 1979, *Webb, Dennis, & Price 2030* (FSU, TENN,

VDB). This report from the northern portion of the Mississippi embayment represents an inland station for a species that Godfrey and Wooten (1979) list as occurring on the "Coastal Plain, L.I. to Fla. Panhandle, w. to e. Tex." The overstory of the swamp from which *E. tortilis* was collected is dominated by *Magnolia virginiana* L., another predominantly coastal plain species which extends northward in the Mississippi Embayment into western Tennessee (Little, 1971).

HYDROCOTYLE UMBELLATA L. Henderson Co.: dewatered shoreline of Dogwood Lake in small embayment on the E side of lake just N of the dam; ca 8 mi NE of Lexington, 6 Sep 1979, *Webb & Dennis 2277* (TENN). Since this collection of *H. umbellata* is from along the shoreline of a relatively recently constructed impoundment, it probably represents an introduction. This species and *H. verticillata* appear to be spreading in the southern portion of the Tennessee Valley and seem to be well adapted to the drawdown zone of artificial impoundments and reservoirs of the region which experience seasonal fluctuations in water levels.—*David H. Webb and W. Michael Dennis, Tennessee Valley Authority, EDB, Muscle Shoals, AL 35660.*

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LINDERNIA ANTIPODA (L.) ALSTON AND *VERONICA CYMBALARIA* BOD. (SCROPHULARIACEAE): NEW TO NORTH AMERICA; *V. HEDERAEFOLIA* L.: NEW TO LOUISIANA—Examination of specimens of Scrophulariaceae from several herbaria has revealed two taxa previously unreported from Louisiana, one of which is new to North America. A third taxon, also new to North America, was discovered during routine collecting in southeastern Louisiana.

The following two species have not previously been reported from North America.

LINDERNIA ANTIPODA (L.) Alston. LOUISIANA. Livingston Parish: wet pine flatwoods along gravel road ca 5 mi SE of Walker in Sec 14 T7S R4E,

Allen & Vincent 9259 (LAF), 5 Aug 1979; Gravelly roadside and disturbed edge of moist pine flatwoods along gravel road ca. 4.4 mi SE of Walker in Sec 17 T7S R4E, *Vincent 3792* (LAF), 15 Aug 1980; Moist sandy loam of open cleared edge of pine-oak flatwoods along gravel road ca 5 mi SE of Walker in Sec 15 T7S R4E, *Vincent 3795* (LAF), 15 Aug 1980. Identification of this Indo-Chinese-Malesian species was confirmed by comparison with specimens borrowed from MO and NY. The plants have lavender-pink corollas, two yellow clavate staminodes, cylindrical capsules to 15 mm long, and flowers solitary in the axils of short linear bracts, either leaf-opposed or opposite in racemes (Philcox 1968). Evidently associated with habitats disturbed by logging activities, this species is established in Louisiana over a 3-4 mile wide area of pine-oak flatwoods. *Lindernia antipoda* is listed by Reed (1977) as an economically important weed with potential for introduction into the United States. Duplicates of *Vincent 3792* are being sent to MO and NY.

VERONICA CYMBALARIA Bod. LOUISIANA. Ouachita Parish: lawn, 912 Riverside, Monroe, *McCartney s.n.* (NLU, VDB), 24 Feb 1975; Common weed in lawn under *Magnolia grandiflora* at Magnolia Terrace Apartments, 900 Riverside Drive, Monroe, *Thomas & McCoy 75132* (LAF, NLU), 25 Mar 1981. Comparison with specimens borrowed from MO and NY confirms the identification of this material as the Eurasian weed *V. cymbalaria*, which has white flowers, obovate sepals patent in fruit, and turgid capsules covered with thick, 2-3-celled hairs (Fischer 1978, Walters and Webb 1972). Considered a serious weed in Russia, *V. cymbalaria* is also listed by Reed (1977) as an economically important weed with potential for introduction into the United States. The species is evidently common on the 1200 block of Riverside Drive in Monroe (R. Dale Thomas, pers. comm.).

The following species is new to Louisiana.

VERONICA HEDERAEFOLIA L. LOUISIANA. Caddo Parish: along ditch running E to W in Querbes Golf Course, behind 3800 block of Greenway, Shreveport, *Burns 13* (LSUS), 28 Mar 1978. This species was previously known in North America from Ontario to Ohio and south to North Carolina and Georgia (Pennell 1935, Radford et al. 1968). The Louisiana specimen considerably extends southwestward the adventive range of this Eurasian species.

I thank the curators and staffs of LSUS, MO, NLU, NY, and VDB for loan of specimens, Dr. R. Dale Thomas for duplicates and helpful information, and Dr. W. D. Reese for reviewing the manuscript.—*Karl A. Vincent, Department of Biology, University of Southwestern Louisiana, Lafayette, LA 70504.*

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CLEOME VISCOSA L. (CAPPARIDACEAE)—NEW TO LOUISIANA

—*Cleome viscosa* is a pantropical weed, probably native to tropical Asia, that is very abundant in the West Indies and less so in Bermuda, Central America, and Brazil (see Iltis, Brittonia 12(4):279–294. 1960.) Within the United States the plant has been reported from Pennsylvania, New Jersey, and Florida. The plants cited below are coarse, viscid, and strong smelling (somewhat with the odor of burning *Cannabis*) herbs characterized by their palmately compound leaves with five leaflets and erect siliques of about 5–7 cm in length when mature. Flowers are yellow, with the bases of the petals and sepals being purplish. The abundance of this species at the Clarence station suggests that it may have been present for some time and has probably become a permanent part of the Louisiana flora.

Appreciation is extended to Sidney McDaniel of the Institute for Botanical Exploration, Mississippi State, Mississippi, for initial determination and to Hugh Iltis of the University of Wisconsin, Madison, for verification.

LOUISIANA. Natchitoches Parish: Natchitoches, roadside, La. Hwy 6, $\frac{1}{4}$ mi E of La. Hwy 1 Bypass, 19 Sep 1980, *Holmes 3963* (NATC, WIS, IBE; others to be distributed to ALA, NLU, NO); 3 mi E of Clarence on U.S. Hwy 84, in fields, Sep 1980, *Dean s.n.* (NATC); same data as *Dean s.n., Yazdani s.n.* (NATC) and also *Bainette s.n.* (NATC).

—*W.C. Holmes, Herbarium, Department of Biological Sciences, Northwestern State University, Natchitoches, LA 71457.*

POLYPOGON ELONGATUS H.B.K. (POACEAE) NEW IN TEXAS[1]

Recent collections made in the Trans-Pecos region of Texas showed that the distribution range of *Polypogon elongatus* H.B.K. has extended into this area. The population was found in Texas; Brewster County: Calamity Creek,

[1] This is a Technical Bulletin No. T.A. 16667, Texas Agricultural Experiment Station.

approximately 40 km S of Alpine along Hwy 118, 8 Aug 1980, *Morden and Hatch 70* (TAES) and 1 May 1981, *Morden 371* (TAES). It was growing in sandy soils of the creek bed which passed under the highway.

This find is significant because it is the first reported collection from Texas. Specimens from the SRSC collection in Alpine were studied and *P. elongatus* was not found. The nearest U.S. collections are over 700 kilometers to the northwest in southern Arizona. Previously, the distribution of *P. elongatus* was reported to extend from Arizona to Argentina (Chase, 1951). Beetle (1977) reported the range in northern Mexico extends from Chihuahua, Coahuila, and Nuevo Leon southward. Neither Gould (1975) nor Martin and Hutchins (1980) list *P. elongatus* as being present in either Texas or New Mexico.

Polypogon elongatus is a perennial grass with culms that often reach one meter in height, and a contracted panicle 15–30 cm long, branches clustered and densely flowered to the base. Disarticulation in *Polypogon* is at the base of the one-flowered spikelet. The characteristic of *P. elongatus* that separates it from other *Polypogon* species is glumes which gradually taper to an awn, whereas the other species have glumes which are lobed at the apex with a dorsal awn or are otherwise abruptly rounded at the summit.

Data from specimens at TAES indicate that *P. elongatus* requires favorable moisture conditions. Collection data on speimens from Central America south to Venezuela, where there is higher precipitation, indicates that *P. elongatus* is found growing on hillsides and in meadows. In northern Mexico, Arizona, and California this species is associated with stream banks and marshes.

It is likely this species is more prevalent in streams of the West Texas-Mexico mountains. However, the floristics of this area is not well known and more work will increase the distribution of many species not previously recorded in Texas.—*Clifford W. Morden and Stephan L. Hatch, Department of Range Science, Texas A&M University, College Station, TX 77843.*

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GOULD, F. W., 1975. The grasses of Texas. Texas A&M University Press, College Station, Texas. p. 653.

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DISTRIBUTION AND NATURALIZATION OF *CYPERUS BREVIFOLIOIDES* (CYPERACEAE) IN EASTERN UNITED STATES—Over

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the past 2 years several collections of *Cyperus brevifolioides* Thieret & Delahoussaye made in Tennessee, Alabama, and Georgia considerably expand the known range of the species in the United States. Prior to a study by Delahoussaye and Thieret (1967), *C. brevifolioides* was not a recognized species but was included as a variety under *C. brevifolius* (Rottb.) Hassk. In examining specimens from 18 herbaria, Delahoussaye and Thieret (1967) documented the occurrence of *C. brevifolioides* from a total of eight localities in Connecticut, Pennsylvania, Virginia, and North Carolina. Only recently, Kral (1981) reported *C. brevifolioides* from the Nashville Basin of middle Tennessee. Included in the collections at TENN, which were not examined by Delahoussaye and Thieret, are two Tennessee specimens collected by Nathan H. Woodruff in 1941. Both were originally identified as *C. brevifolius* but, subsequent to the treatment of Delahoussaye and Thieret (1967), the specimens were determined by Dr. H. R. DeSelm of the University of Tennessee to be *C. brevifolioides*. A lack of knowledge concerning the distribution of the species in Tennessee and its apparent rarity in the United States prompted the Committee for Tennessee Rare Plants (1978) to list *C. brevifolioides* as a plant of "special concern" in Tennessee.

Our recent collections are from three physiographic provinces—the Cumberland Plateau, the Ridge and Valley, and the Blue Ridge. The species appears to be a vigorous competitor and has been observed in a variety of habitats such as wet seeps in mowed fields and lawns, gravel bars of rivers, wet margins of streams, and borders of lakes and reservoirs. Although no seed germination tests have been conducted, field observations indicate an abundant production of well formed achenes and suggest a potentially high sexual reproductive capacity. Once established, the species spreads vegetatively by means of an extensive rhizome system.

According to Delahoussaye and Thieret (1967), *C. brevifolioides* was then "previously recorded only from far eastern Asia." The species is apparently established and spreading in eastern United States. It seems significant that the first known collection of the species from the United States was made barely a century ago from the Centennial Grounds in Philadelphia. The recent collections in eastern Tennessee, northwestern Georgia, and northeastern Alabama suggest either that the species is expanding its range or that it has simply been overlooked. It is more probable that the species has only recently become well established in east Tennessee since the region has been intensively collected by many notable field botanists. Recent collections from Georgia and Alabama indicate that *C. brevifolioides* is rapidly expanding its range in the Tennessee Valley.

Based on current knowledge of the habitat and distribution of *C. brevifolioides* in the United States, it would seem to be a naturalized taxon that is expanding its range and not a rare species requiring special monitoring.

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Intensive collecting will likely result in additional reports of *C. brevifolioides.* Recent collections and specimens examined are listed below accompanied by the location of vouchers.

Specimens examined: ALABAMA. Marshall Co.: dewatered shoreline of Guntersville Reservoir in Town Creek embayment in Lake Guntersville State Park at boat launch near swimming area, 6 Nov 1980, *Webb & Bates 3711* (VDB). GEORGIA. Walker Co.: abundant around the mouth of Crawfish Springs in Chickamauga, Ga., 4 Nov 1980, *Dennis & Pittman 2411* (GA, TENN, VDB). TENNESSEE. Bradley Co.: marshy area along outflow of Red Clay Spring in Red Clay Springs State Park; ca 9 mi W of Conasauga, TN, 4 Oct 1979, *Webb & Dennis 2427* (TENN, VDB); Greene Co.: sandy shore of Davy Crockett Lake, ca 1.5 mi above Nolichucky Dam, 27 Sep 1979, *Webb & Dennis 2399* (TENN, VDB); Knox Co.: damp meadow along Fort Loudon Lake, 0.8 mi W of boat launch in a roadside park off Cherokee Boulevard, Knoxville, 1 Aug 1979, *Patrick & Nakosteen 1060* (TENN); Marion Co.: small island at the mouth of Running Water Creek on Nickajack Reservoir; ca 0.5 mi SE of jct. I-24 and TN 156 along I-24, 28 Oct 1980, *Webb & Murphy 3695* (FSU, TENN, VDB); Monroe Co.: gravel bar along the Tellico River near TRM 21; ca 6 mi upstream from where Ballplay Road (Sloan Bridge) crosses the Tellico River, 23 Sep 1980, *Webb & Dennis 3533* (TENN); Sullivan Co.: damp, north bank of South Fork Holston River about 1.8 mi below South Holston Dam, just W of bridge, 4 Nov 1979, *Nakosteen, Dennis, & Young 2* (TENN); Washington Co.: around swamp and Nolichucky River, Embreeville, 24 Aug 1941, *Woodruff s.n.* (TENN).

—David H. Webb and W. Michael Dennis, Tennessee Valley Authority, EDB, Muscle Shoals, AL 35660; Thomas S. Patrick, Department of Botany, University of Tennessee, Knoxville, TN 37916.

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DELAHOUSSAYE, A. J. and J. W. THIERET. 1967. *Cyperus* subgenus *Kyllinga* (Cyperaceae) in the continental United States. Sida 3: 128–136.

KRAL, R. 1981. Further additions to some notes on the flora of the southern states, particularly Alabama and middle Tennessee. Rhodora 83: 301–315.

NOTICE

Dr. Peter H. Raven has kindly informed me that the correct name for *Gaura odorata* Lag., which I recently reported from Louisiana (Vincent, 1980), is *Gaura drummondii* (Spach) T. & G. (Raven and Gregory, 1972). The species has also been introduced into California, with locally established populations recorded from Arkansas and Georgia.—*Karl A. Vincent, Department of Biology, University of Southwestern Louisiana, Lafayette, LA 70504.*

REFERENCES

RAVEN, P. H. and D. P. GREGORY. 1972. A revision of the genus *Gaura* (Onagraceae) Mem. Torr. Bot. Club 23(1): 1–96.

VINCENT, K. A. 1980. *Gaura odorata* Lag. (Onagraceae) in Louisiana. Sida 8: 354–355.

REVIEWS

A SYNONYMIZED CHECKLIST OF THE VASCULAR FLORA OF THE UNITED STATES, CANADA, AND GREENLAND. Vol. II. The Biota of North America. Kartesz, John T. and Rosemarie Kartesz. The University of North Carolina Press, Chapel Hill, N.C. 1980. 499 pp. $35.00.

This checklist is part of an on-going attempt to produce a flora of North America and is the second volume of the Biota of North America. The most logical approach to the final objective is the production of a checklist. A checklist is the beginning, unfortunately often the climax, of the basic contents of a future flora. C. R. Bell, in the Foreword, clearly states that the list may be the foundation for a unified treatment of the flora of North America which Muhlenberg first proposed in 1790-1792. A future edition of this checklist will reflect new data. However, this listing will remain basic to the whole.

In addition to the checklist, the book includes the Introduction which contains explanations of Developmental Design, Format, Excluded Taxa, Geographic Scope, Synonymy, Author Citations, Specialist Review, and Uniformity and Anomalous Names. Following the Introduction, are sections on Acknowledgments, Reviewers and Cooperating Specialists, Excluded Names, Summary of Vascular Plant Taxa Treated, the Checklist (Pteridophyta, Gymnospermae, Angiospermae) and the Index.

With a publication date of 1980, the most recent nomenclatural changes are not in evidence as one would expect. Several nomenclatural discrepancies seem to be perpetuated and a few of these are noted below. (Ref.: Man. Leg. Tenn., J. Tenn. Acad. Sci. 45(3): 65–96. 1970).

Wisteria macrostachya, a manuscript name of Nuttall, has persistently been attributed to Nuttall but the correct author citation should be (Nutt.

ex T. & G.) Robins. & Fern. (Gray's New Man. Bot. 7th ed. p. 515 1908).

Sesbania macrocarpa Muhl. (Cat. Pl. Am. Sept. 65. 1813) has been regarded as a *nomen nudum* (Wilbur, R. L. 1963. The Leguminous Plants of North Carolina, N.C. Agric. Exp. Sta. Tech. Bull. No. 151. p. 198). The distinguishing characters in Muhlenberg's Catalog were the yellow petals and long pods which characterize this taxon. Synonymy: *Darwinia exaltata* Raf., Fl. Dudov. 137. 1817; *Sesban exaltata* (Raf.) Rydb., N. Am. Fl. 24: 204. 1924; *Sesbania exaltata* (Raf.) Rydb. ex A. W. Hill, Ind. Kev. 7: 223. 1929.

Schrankia microphylla (Dry. ex Smith) MacB., in accordance with the Internatinonal Code of Botanical Nomenclature, should include Smith as the publishing author since he published the taxon in "Lepidopterous Insects of Georgia" (2: 123. 1797).

Baptisia alba (L.) Vent. and *B. tinctoria* (L.) Vent. are often attributed to R. Brown in Ait. (Hort. Kew ed. 2. 3: 6. 1811). However, Ventenat (Dec. Gen. Nov. 9, 1808) founded the genus *Baptisia* basing the description on *Crotalaria alba* L. and *Sophora tinctoria* L. These basionyms were cited but were not accompanied with species descriptions because descriptions are not necessary for new combinations.

Carya illinoinensis (Wang.) K. Koch was correctly utilized by Correll and Johnston (Man. Vasc. Pl. of Tex., Tex. Res. Found., Renner, 1970). According to Wolstenholme and Storey (Pecan Quarterly 4(3): 17. 1970), the problem of the spelling of the specific epithet was discussed at the Eleventh International Botanical Congress in Seattle in August, 1969 and "It was agreed that the correct scientific name for the pecan is *Carya illinoensis* (Wang.) K. Koch." Unfortunately, this is not how one determines the correct name of a plant.

Mitracarpus hirtus (L.) DC. Since the typification of this taxon by Nicholson (Taxon 26: 569-574. 1977), *M. villosus* should be relegated to synonymy.

This volume is an especially valuable reference and since it is computerized, the appropriate changes may be incorporated efficiently in the future. For a reference of this magnitude, the price of $35 is in accord with the current economics.—*Wm. F. Mahler and Barney L. Lipscomb, SMU Herbarium, Dallas, TX 75275.*

THE WAY OF HERBS: SIMPLE REMEDIES FOR HEALTH & HEALING. Michael Tierra. Unity Press, 1980. 216 pp. $6.95.

This is a book about herbal medicine covering many aspects from metaphysical discussions of the disease process, to diagnosis and treatment. Like a number of books published in the last few years it is a product of increasing popular interest, awareness, and participation in self health. Herbal

medicine is not new. It is the foundation of modern medicine, but to most present day Americans it is a foreign concept. Herbal medicine (and this book) represents an alternate approach to medical treatment and as such does not conform to our traditional thoughts on medicine. This may create a problem of acceptance for many readers. However, for those seeking information about alternate medical treatment or those seeking a practical introduction to herbal remedies this book is a good place to start. The reader should find this book pleasant reading, both in the way ideas are developed and its clear and concise style. The book begins with a metaphysically oriented discussion of health and sickness appropriate for both herbalistic and holistic approaches to medical treatment. In addition to the how to/when to chapters the author has included chapters on diagnosing ailments, storing herbs, making travelers first aid kits, kitchen medicines, and buying herbs, etc. There is also an encyclopedic chapter including 80 commonly used herbs.

There were several facets of this book I felt to be problem areas. First is the emphasis on simplistic and metaphysical explanations for illnesses along with simplistic explanations for herbal effects (cures) that do not do justice to current knowledge of disease. Perhaps to believe that a particular disease is simply the imbalance of Yin and Yang and by availing oneself of a "hot" or "cold" herb this balance can be restored, or that certain herbs "purify" the blood, might tend to comfort some people but they do not represent adequate explanations. Ignorance of the contribution of science to the understanding of bodily function, purposeful or not, tends to limit the acceptance of herbal therapy and certainly does not inspire confidence in their use. This is further exemplified by statements (unreferenced) that; *Echinacea angustifolium* promotes white blood cell production, and that the blue and black cohosh, raspberry and rue are listed in one section of the book as herbs that act as antispasmotics while in another section as herbs that stimulate uterine contraction (smooth muscle is smooth muscle whether in the digestive tract or uterus).

A second problem concerns the attitude that "all herbs are harmless if used properly." Under this generalization prescriptions for some potentially harmful plants are given, e.g. Aconite (variably poisonous), Poke (mitogenic), Podophyllum (teratogenic). Many of these effects may be delayed in their expression and the offending material very effective at low concentrations. There will be some people who are allergic to various plant products and for whom even the "correct" dosage may cause harmful effects.

Since it would seem to be a rather basic skill, greater emphasis should be placed on proper identification of plants and how a person might go about learning to identify plants. The use of common names often presents a problem, e.g. the author prescribes a herb called mandrake—a name he applies to *Podophyllum peltatum* (known in the U.S. as May apple or Thorn

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apple), another common usage of the name mandrake refers to *Mandragora officinarum*, a much more poisonous plant than *P. peltatum*.

Although the information in this book is not based on scientific evidence the book ranks well above many similar books on the market today and does represent a beginning attempt at bringing together elements of classical medicine and classical herbology. Reading books such as this encourage one to appreciate the fact that modern medicine has erred no less for its ignorance of the potential use of herbal remedies than herbology has for its ignorance of modern medical knowledge.—*Wayne R. Fagerberg, Department of Biology, Southern Methodist University, Dallas, TX 75275.*

ACTA BOTANICA ACADEMIAE SCIENTIARUM HUNGARICAE, Volume 26, fascicules 3–4, 28 Jul 1980, pp. 231–478. (Sixteen papers, 3 of particular interest to Systematic Botanists. New names and new species in the flora of Cuba, II, by A. Borhidi; *Acunaeanthus*, a new genus of Rubiaceae by A. Borhidi, M. Járai-Komlódi, and M. Moncada; Mosses of Vietnam I, by Tran Ninh).

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BILLIETURNERA (MALVACEAE), A NEW GENUS FROM TEXAS AND MEXICO

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ABSTRACT

The species *Sida helleri* is segregated out of *Sida* and placed in the new genus *Billieturnera*, named in honor of the noted Texas botanist, B. L. Turner. The new genus is of isolated taxonomic position but has a greater affinity with *Abutilon* than with *Sida*. It occurs in southern Texas and northeastern Mexico (Nuevo León and Tamaulipas).

Billieturnera Fryxell, nom. et stat. nov.

Based on: *Sida* sect. *Incanifolia* Clement, Contr. Gray Herb. Harvard University 180: 60. 1957. TYPE SPECIES: *Sida grayana* Clement ex Kearney

Perennial ascending subshrub, frequently more or less procumbent, commonly on poorly drained (caliche, gypsiferous, or heavy clay) soils, seldom more than a few cm tall. Plant softly stellate-pubescent more or less throughout, the hairs 0.5–1 mm long, sometimes stipitate. *Leaves* cuneate, sparingly dentate to subentire, 0.5–1.5 cm long, about as broad. *Petioles* about half length of lamina. *Stipules* prominent, broadly oblanceolate and obtuse (to 3.5 mm broad), persistent, subequal to petiole. Flowers solitary in the leaf axils, subsessile, the *pedicels* up to 2.5 (–5) mm long, medially articulated. *Involucel* absent. *Calyx* 5–7 mm long, more than 2/3-divided, the lobes narrowly triangular, 2–6 times as long as wide. *Petals* pale yellow, somewhat exceeding calyx, 5–8 mm long, ca 3 mm broad, obovate, glabrous. *Staminal column* pallid, with few minute scabrid hairs, dividing apically into ca 20 filaments (imperfectly associated in 5 fascicles), the filaments 1–1.5 mm long, the anthers pallid. *Styles* 5, pallid, glabrous, exceeding androcecium and subequal to petals; *stigmas* pallid, capitate or capitellate. *Fruit* ca 5 mm long, 4.5 mm diameter, variable in form, enclosed in calyx; *mericarps* 5, each with prominent apical spine 1–1.5 mm long becoming double after dehiscence, somewhat inflated, more or less elliptical in cross-section, with dorsal keel; *seed* solitary in lower part of carpel, pendulous, ca 2 mm long, dark brown, minutely and obscurely pubescent.

Clement (1957) recognized the distinctiveness of this taxon as *Sida* sect. *Incanifolia* Clement. He acknowledged the resemblance of the fruits to those of *Abutilon* but nevertheless retained his section within *Sida*, following earlier understandings and practice, simply because it has uniovulate carpels and lacked an involucel. It is now understood that the number

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of ovules and seeds per carpel can sometimes be misleading and that other factors need to be considered in evaluating generic placements and generic affinities in the Malvaceae. In the present case, the morphology of the fruits clearly points to a general affinity with *Abutilon* and virtually no affinity with *Sida*, except in having the uniovulate condition. Traits supporting an affinity with the *Abutilon* alliance (as proposed by Bates & Blanchard, 1970, and modified by Fryxell, 1971) include a base chromosome number of $x = 8$ (Bates, 1976), which is characteristic of *Allowissadula* Bates and part of *Abutilon*, and pollen grains having only three apertures (Hashmi, 1970). The same base chromosome number occurs in some members of the *Sida* alliance, but pollen grain apertures are generally more numerous, except in the genus *Malvella* (which may in fact not be properly placed in the *Sida* alliance). The matter of mericarp morphology, however, clearly indicates that *Billieturnera* has its affinities with the genera of the *Abutilon* alliance (here taken to include *Abutilon* sens. lat., *Allowissadula, Wissadula* Med., *Bastardiastrum* (Rose) Bates, *Bastardia* H.B.K., *Hochreutinera* Krapov., and *Briquetia* Hochr.). In the *Abutilon* alliance, mericarps are basically elliptical in cross-section with a more-or-less well-developed dorsal keel. In the *Sida alliance*, on the other hand, mericarps are trigonal in cross-section with a dorsal wall clearly differentiated from the two lateral walls (Fryxell, 1971).

Therefore, in considering whether *Billieturnera* merits segregation as a distinct genus, we need to consider its relationship to the genera of the *Abutilon* alliance, but we may ignore its relationship to the genera of the *Sida* alliance. I believe one should not segregate monotypic genera too freely, but only if a strong case for their naturalness can be made (Grashoff, 1975, following the criteria of McVaugh, 1945). I am unable to find a single species among the several genera of the *Abutilon* alliance with which the present species might be allied. Its leaf form is unique. Its stipules are unique. Its humble growth habit is approached only by species like *Abutilon parvulum* A. Gray, *Abutilon terminale* (Cav.) St.-Hil., or *Wissadula glechomatifolia* (St.-Hil.) R. E. Fries, which are manifestly unrelated. Its uniovulate carpels are matched only by species of *Bastardia* (having an entirely different growth habit and a base chromosome number of $x = 7$) and *Abutilon* sect. *Tetrasida* (Ulbrich) Krapov., a taxon that perhaps merits recognition as the genus *Abutilothamnus* Ulbrich; Krapovickas (1969) recognized eight species in the section to which one or two more species might be added. These species, however, are principally large-leaved trees of predominantly South American distribution and are very unlike *Billieturnera* in all characters except in having uniovulate, pentamerous fruits. The strictly pentamerous fruits of *Billieturnera* also occur in *Allowissadula*, some species of *Abutilon* (of sects. *Tetrasida, Oligocarpae*, and *Anasidae*), and *Bastardia bivalvis*, but again the present species can be accommodated in none of these groups without stretching their bounds beyond reasonable limits and rendering them artificial taxa.

The distribution of *Billieturnera* is more or less distinctive, occurring in South Texas, Tamaulipas, and part of Nuevo León. In this region it does overlap species of *Abutilon, Allowissadula*, and *Bastardia*, but if one considers both the geographic and the ecological distribution of *Billieturnera*, its distribution is clearly distinctive. Its preference for heavy, saline soils gives it virtually a unique niche among the Malvaceae. The only other Malvaceae of this general region to occur on such soil types are *Cienfuegosia drummondii* (A. Gray) Lewton (of a different tribe within the family and thus quite unrelated) and the three species of *Malvella* (Fryxell, 1974). Doubt has already been expressed about the placement of *Malvella* within the *Sida* alliance, but no better placement immediately presents itself. Therefore, a relationship between *Billieturnera* and *Malvella* must be considered. They share not only a preference for saline habitats and a humble growth habit, but also 3-aperturate pollen grains and a compatible base chromosome number (x = probably 16 in *Malvella*; x = 8 in *Billieturnera*). One species of *Malvella, M. leprosa* (Ortega) Krapov., also has a somewhat similar leaf shape. But the differences are also marked. *Malvella* differs from *Billieturnera* in being herbaceous and prostrate, in having asymmetrical distichous leaves, inconspicuous subulate stipules, sometimes lepidote pubescence, long-pedicellate flowers and fruits, a sometimes present involucel, broadly ovate or cordate calyx lobes, and unornamented essentially indehiscent mericarps. I believe these differences are sufficient to prevent combining the two genera. The presence of an involucel and the different mericarp morphology especially deserve emphasis. I believe the similarities betwen *Malvella* and *Billieturnera* are incidental rather than indicative of close alliance. Clement (1957) also emphasized the difference between these two taxa, which he recognized as *Sida* sect. *Pseudomalachra* (= *Malvella*) and *Sida* sect. *Incanifolia* (= *Billieturnera*).

Thus, *Billieturnera* appears to be a distinctive genus meriting segregation, having an alliance with *Abutilon* and its allies, but being relatively isolated within this group. It is a plant of humble mien but having a salty nature (at least in its soil preference), frequently procumbent, inhabiting Texas and Mexico, of isolated taxonomic position (i.e. without peer), and it thus appropriately memorializes the noted Texas botanist, Billie Lee Turner. Now you can't say that no one ever named a genus after you, Billie!

BILLIETURNERA **helleri** (Rose) Fryxell, comb. nov.

Basionym: *Sida helleri* Rose ex Heller, Contr. Herb. Franklin & Marshall College (Bot. Explor. S Texas) 1: 66. 1895. TYPE: TEXAS. Nueces Co: shores of Corpus Christi Bay, *Heller 1533* (ARIZ!, F!, GH!, LE!, MICH!, NY!, PH!, UC!, US!).

Synonym: *Sida cuneifolia* A. Gray, Boston J. Nat. Hist. 6: 165. 1850 (non Roxb. 1832). TYPE: TEXAS. [Maverick County:] 35 mi NE of Eagle Pass, 1848, *Wright s.n.* (HOLOTYPE: GH!; fragment: US!). *Disella cuneifolia* (A. Gray) Greene, Leafl. Bot Observ. Crit. 1: 209. 1906. *Sida grayana* Clement in Kearney, Leafl. W. Bot. 7: 140. 1954.

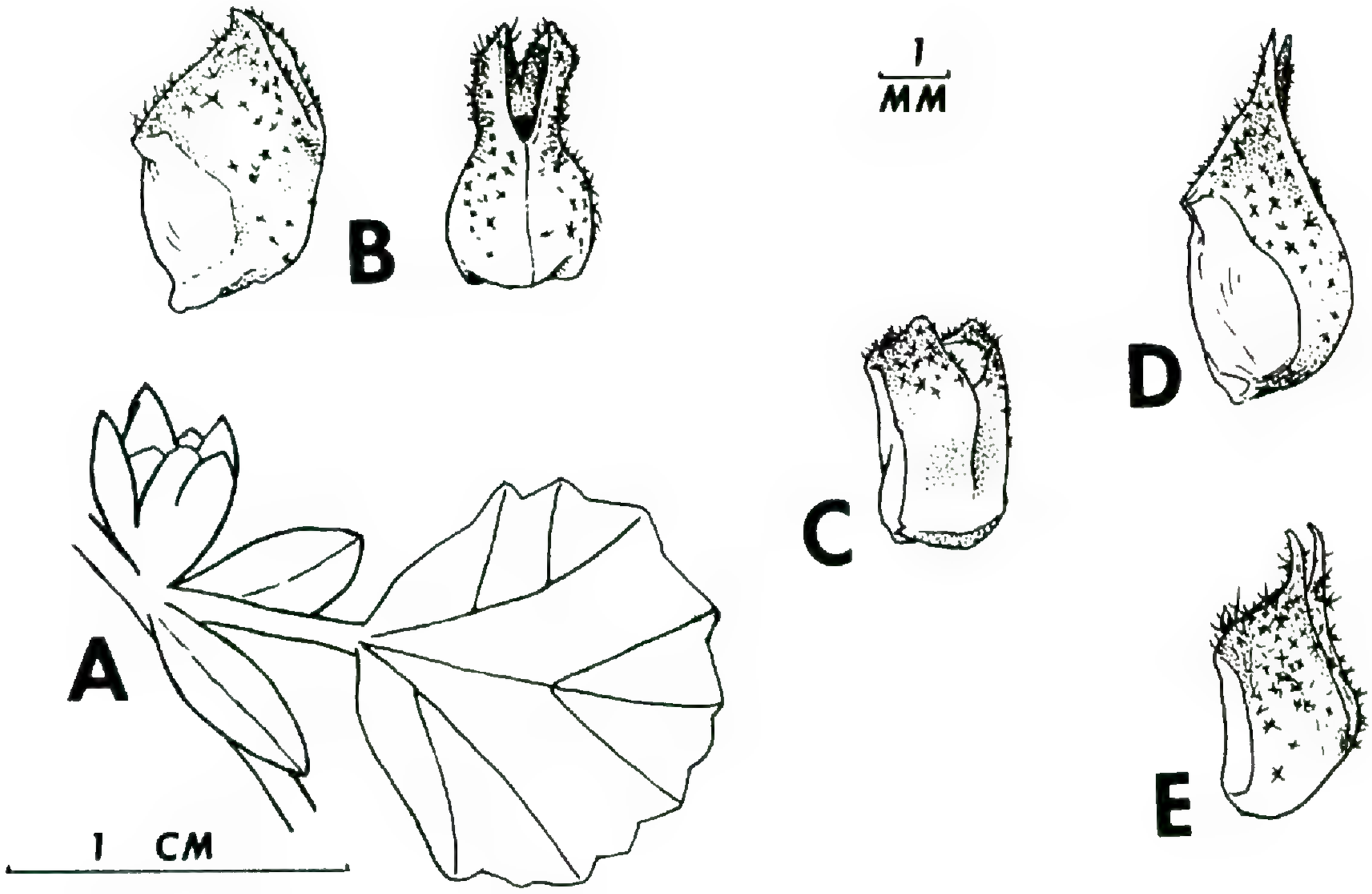

Figure 1. *Billieturnera helleri.* A, leaf and stipules with young axillary bud (pubescence omitted); B, individual mericarp in lateral and dorsal view [A-B, *Heller 1533*, the type]; C-E, individual mericarps (C, *Jones 28239*; D, *Correll 35440*; E, *Bartlett 10969*), showing morphological variability.

Clement (1957) recognized two species in this group but the distinctions he noted are not borne out by an examination of a wide range of material. The morphology of the mericarps is quite variable (see Fig. 1), but the variation appears to be continuous rather than discrete and is correlated with no other characters. Therefore, the plants are here interpreted as a single species, variable in fruit morphology.

Specimens examined: MEXICO: TAMAULIPAS: 6 mi S of Santander Jiménez, *M. C. Johnston & Graham 4390* (MEXU, MICH, TEX); 4 mi S of Jiménez on the Soto la Marina road, *M. C. Johnston & Crutchfield 4990* (MEXU, MICH, TEX); 21 mi N of Victoria on the Villagran hwy, 3 mi S of Río Purificación crossing, *M. C. Johnston & Crutchfield 5440* (MEXU, MICH, TEX); 4 mi S of Rancho Guadalupe, ca 25 mi from [S of ?] Linares, N. L., *M. C. Johnston & Graham 4261* (MEXU, MICH, TEX); Sierra de San Carlos, vicinity of El Mulato near Tanque, *Bartlett 10969* (DS, MICH); 8 mi S of Tres Palos (119 km N of Cd. Victoria), *Fryxell 1087* (ARIZ, BH, CTES, MEXU, UC, pf); on Peninsula Punta Piedra, S of Carboneras, *Fryxell 3647* (CHAPA, ENCB, MICH, MEXU, TEX, pf); El Canelo Ranch, 24 mi N of San Fernando (hwy to Matamoros), *M. C. Johnston 4864* (MEXU, MICH, TEX). NUEVO LEON: 20 mi E of General Bravo, badlands of the Jackson formation, *M. C. Johnston 4359* (MEXU, MICH, TEX); 23 mi E of General Bravo on Reynosa hwy, *M. C. Johnston & Crutchfield 6060* (LL, MICH,

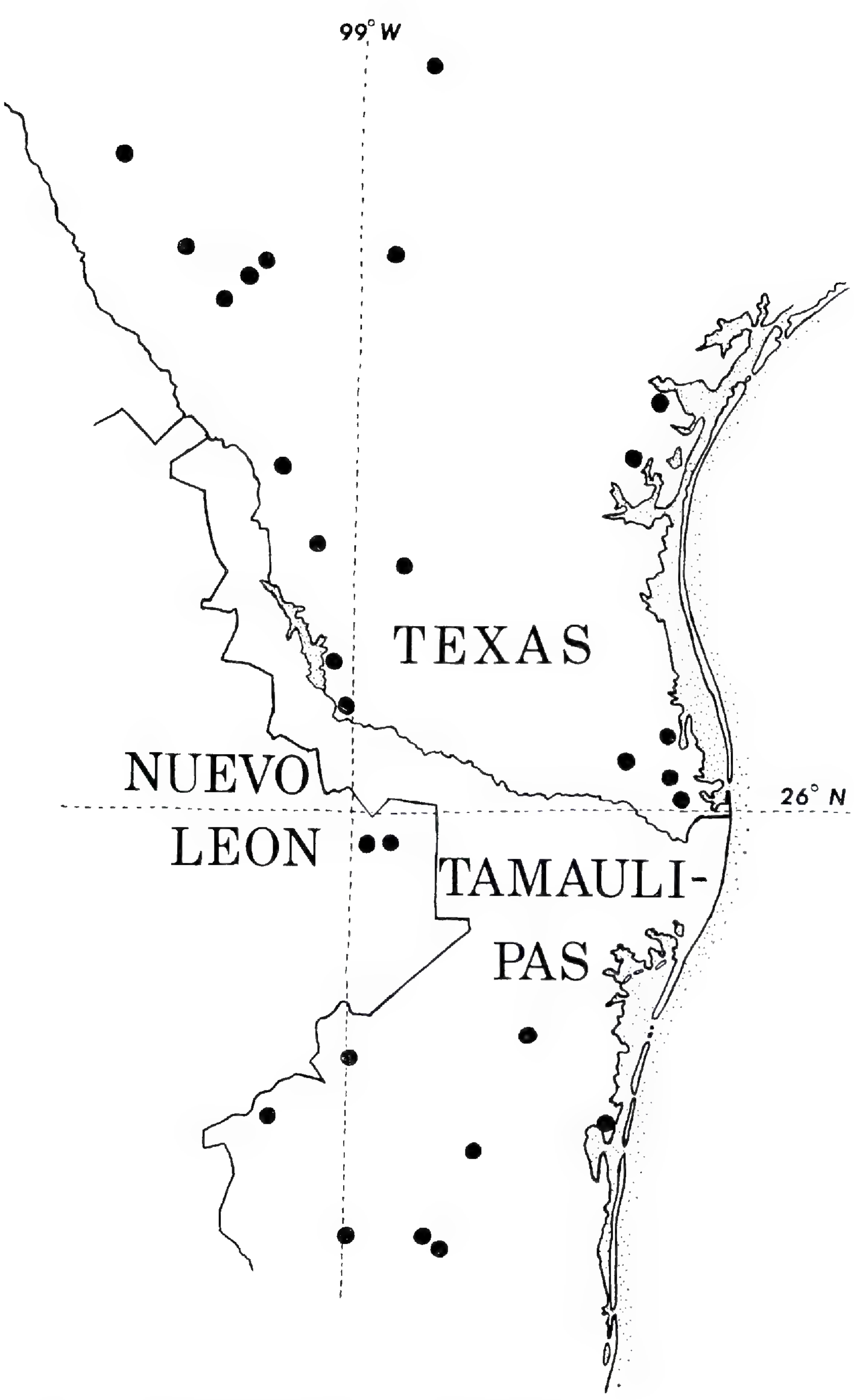

Figure 2. Geographical distribution of *Billieturnera helleri*.

TEX, UC). UNITED STATES: TEXAS. Cameron County: Loma Alta, 8 airline mi NE of Brownsville, *Cory 51383* (DS, SMU, UC), *Runyon 2942* (TEX) *5082* (TEX) *6032* (TEX); top of Loma de la Cuchilla, a clay dune W of Port Isabel, *M. C. Johnston 542195* (SMU, TEX); Arroyo Colorado, 2 mi E of Harlingen, *M. C. Johnston 541360* (TEX) *541361* (TEX); Laguna Atascosa Wildlife Refuge, *Fleetwood 3493* (TEX) *3529* (TEX); El Jardin Tract, *Runyon 455* (TEX) *654* (TEX). Starr County: 1/2 mi W of Roma, *Wood 749* (SMU, TEX); Falcon State Park, *Fleetwood 11588* (SMU, pf); ca 4 mi W of Fort Ringold, *Tharp & York 13* (ENCB, TEX). Zapata Co: 23 mi NE of San Ignacio, *Correll 35440* (LL., UC). Jim Hogg Co: 25 mi S of Hebronville, *Hanson 30* (MO, US). Kleberg Co: King Ranch, Laureles Division, ca 1 mi W of Portales Verde Well, *Miller & Miller 1058* (SMU). Nueces Co: shores of Corpus Christi Bay, *Heller 1533* (ARIZ, F, GH, LE, NY, UC, US). Webb Co: 7 mi E of Laredo, 26 Apr 1919, *Manson s.n.* (NY). LaSalle Co: 12-1/3 mi W of Fowlerton, *Cory 14979* (TEX); 2 mi S of Los Angeles, *Cory 14980* (GH). Dimmitt Co: Carriso Spring, *Jones 28239* (CAS, DS, UC); ca 3 mi S of Catarina, *Fryxell 2938* (CHAPA, CTES, ENCB, NY, pf), *Correll & Johnston 19503* (LL, SMU); 10 mi S of Big Wells, *Tharp 593* (TEX, US). Atascosa Co: 3 mi S of Hindes, *M. C. Johnston 6198* (ENCB, LL, TEX). Maverick Co: 35 mi NE of Eagle Pass, 1848, *Wright s.n.* (GH, US). Bexar Co: near San Antonio, *Parks 4819* (MO).

Without precise locality (Nuevo León, fide Clement): *Berlandier 3104* (PH, US).

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NEW SPECIES OF *CLITORIA* SUBGENUS *BRACTEARIA* SECTION *CAULIFLORAE* (LEGUMINOSAE) FROM COLOMBIA AND BRAZIL[1]

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Members of *Clitoria* L. subgenus *Bractearia* (Mart. ex Benth.) Fantz section *Cauliflorae* Fantz are typically lianas that bear both cauliflorous inflorescences below the leaves and often axillary inflorescences in the upper leafy portions of the plant. Within the genus *Clitoria* cauliflory is unique to section *Cauliflorae*. Flowers with narrow bracteoles and conspicuous calyx lobes distinguish members of section *Cauliflorae* from lianas belonging to other sections of subgenus *Bractearia*, particularly when a specimen might not exhibit cauliflory. Section *Cauliflorae* comprises the following species (Fantz, 1979): *C. arborescens* R. Brown in Ait., *C. coriacea* Schery, *C. javitensis* (H.B.K.) Benth., *C. leptostachya* Benth., *C. obidensis* Huber, *C. sagotii* Fantz, *C. selloi* Benth., and the three species described below.

1. CLITORIA **cavalcantei** Fantz, sp. nov.

Frutex parvus, caulibus lignosis altis volubilius. Folia trifoliata, *glabrescentes*; foliolis ellipticis ad elliptico-oblongis, longiacuminatis. *Inflorescentiae brevissimae, 0.5–1.5 cm longae*, axillares et cauliflores, racemoso-nodosae, pauciflorae. Flores magni, 6–7 cm, roseopurpureo. Calyces trichomatibus dispersis appressis, tubo 16–20 mm, lobis 5–7 mm. *Stylus elongatus, 24–32 mm, longitudine ovarium magnopero superantes. Legumen* (in statu juvenili) stipitatum, planum, *trichomatibus microuncinatis confertis.*

Small shrub with stems tall climbing (=liana). Branches 2–4 mm diam. *Leaves* 3-foliate, coriaceous, nearly glabrous or rarely with a few appressed trichomes along the veins on the lower surface; leaflets elliptic to elliptic-oblong, rarely obovate, apex acuminate, acumen 1–2.5 cm long, base broadly cuneate, midrib subimpressed above, primary veins of 7–9 pairs, lamina 10–17 cm long, 5–9 cm wide. Petiole subterete, 3–6 cm long, pubescence microuncinate; rachis 2–2.5 cm; petiolules rugose, glabrate, 5–6 mm. Stipules deciduous, lanceolate-ovate, acute, sparsely pubescent, 5–6 mm long, 2 mm wide; stipels more or less persistent, linear, acute, glabrate, 3–6 mm long,

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1 mm wide. *Inflorescence* axillary and cauliflorous, few-flowered (4–8 flowers), racemose, more or less nodose, solitary or paired, 0.5–1.5 cm long; axis pubescence microuncinate with falcate-spreading macrotrichomes. Pedicels 5–8 mm, pilose. Bracts ovate, acute, strigose, more or less ciliolate, 3–5 mm long, 1–1.5 mm wide. Bracteoles lanceolate-ovate, acute, 5–7 mm long, 1–2 mm wide, pubescence moderately dense, appressed. *Flowers* large, (5.5) 6–7 cm, corolla rose-colored becoming purplish. Calyx pubescence appressed, thinned, microuncinate trichomes not observed (typically found in closely related species), tube 16–20 mm long, 5–9 mm wide at the base expanding to 8–11 mm wide at the throat, lobes deltoid-ovate, acuminate, usually with a broad-angled sinus (nearly 90°) between the lateral and dorsal teeth, 5–8 mm long, 3.5–5 mm wide, ventral lobe 7–10 mm. Vexillum pubescence conspicuously microuncinate toward apex and margins, appressed macrotrichomes moderate, more or less confined along the veins; blade 3.5–4 cm wide, claw 14–18 mm. Alae extended beyond the carina by 6–11 mm, blade 22–27 mm long, 4–7 mm wide, claw 17–22 mm. Carina falcate, 11–13 mm long, 4–5 mm wide, claw 27–29 mm. Staminal tube nearly straight, 39–46 cm long, free filaments 2–5 mm; anthers lanceolate, 1.6–2.4 mm. Gynophore black, 3–6 mm, pubescence of microuncinate with scattered macrotrichomes; ovary 12–16 mm long, 1 mm wide, pubescence white, sericeous, macrotrichomes dense masking uncinate microtrichomes beneath; style dark-colored, greatly exceeding the ovary length, 24–32 mm long, bearded, geniculate 7–10 mm from the distal end. Legume unknown except in the juvenile state (ca 9.5 x 0.6–0.7 cm), stipitate, flat, swollen around the seeds, densely pubescent with uncinate microtrichomes and scattered, suberect macrotrichomes; stipe 19 mm. Seeds unknown, ca 9 per pod, Figure 1.

TYPE COLLECTIONS: BRAZIL. PARÁ: Cipó lenhoso, flor na anteae, rósea deposis roxo, mata devastade, comum, Parque Ingigena do Tumucumaque, Rio Parú de Oeste, Missão Tiriyo, arredores da Missão, 2°20′N-55°45′W, 1 Mar 1970, *Cavalcante 2570* (HOLOTYPE: NY; ISOTYPES: F 1717517, S, U 256619B). BRAZIL. AMAZONAS: Río Negro, Sapó, Oct 1851, *Spruce 1877* (PARATYPE: K—HO 847/407, hb. Bentham).

The specimen selected as the holotype is the only one examined that bears any fruits. It also contains parts of at least two dissected flowers placed in the packet mounted on the sheet. Specimens from the Royal Botanic Gardens, Kew, did not have an accession number assigned to them. The number cited to identify the type specimen more accurately was the loan and accession number placed on the herbarium sheet when the loan was prepared at Kew.

Specimens of *C. cavalcantei* are usually misidentified as *C. javitensis*, a species which they superficially resemble. When Bentham (1858) revised the genus, *Spruce 1877* was cited as typical of *C. javitensis*, an interpretation confirmed by Sandwith (1931), but rejected by Fantz (1981) who excluded the specimen from the concept of *C. javitensis*.

Figure 1. Holotype of *Clitoria cavalcantei* (*Cavalcante 2570*, NY).

Clitoria javitensis can be distinguished from this new species by a shorter style (17–25 mm) which is subequal to the ovary, the larger fruits bearing conspicuous reddish-brown macrotrichomes and lacking the uncinate microtrichomes, longer inflorescences, and leaflets with 9–15 pairs of primary veins and often some appressed trichomes on the lower surface. The fruits of *Clitoria javitensis* are typically 18–24 cm long and 2–2.5 cm wide. Even though the fruits of *Clitoria cavalcantei* are not fully mature, a comparison to more closely related species such as *C. sagotii* indicate that the fruits of *C. cavalcantei* will probably be near 15 cm long and 1–1.5 cm wide.

Clitoria cavalcantei appears to be closely related to a group of species that includes *C. sagotii, C. coriacea,* and *C. tunuhiensis. Clitoria cavalcantei* is distinguished from these species both by the presence of a calyx with appressed trichomes and the absence of the uncinate microtrichomes of the other three species. Furthermore, it has a longer style, a longer inflorescence, and a larger calyx. The other three species have subsessile inflorescences with a calyx tube of 11–17 mm that is conspicuously uncinate-pubescent, and a style of 21–27 mm.

All known collections of *C. cavalcantei* are from forests of the Amazon Basin in the western Brazilian states of Amazonas and Pará. Flowers have been collected from mid-July to early March, with immature fruits collected in early March.

2. CLITORIA **tunuhiensis** Fantz, sp. nov.

Vites lignosi. Folia trifoliata, *subter rufotomentosi, foliolis* ovatis ad ovato-ellipticis, breviacuminatis, *revolutis leviter, non-ceriferentibus, et costa prominulis super pagino adaxiali.* Inflorescentiae subsessiles, ad 0.8 cm longis, axillares, pauciflorae. Bracteolae lanceolatae, 13–14 mm longae, insertae 2–3 mm subter base calyce. Flores 4.5–5 cm. Calyx pilosis et uncinatis conspicuus, tubo 15–17 mm, lobis 9–11 mm. Unguis vexilli elongatus. Stylus elongatus, longitudine ovarium magnopero superantes. Legumen ignotum.

Liana. Branches 2–3 mm diam., puberulent, rufus becoming whitened with age. *Leaves* 3-foliate, thick membraneous, leaflets ovate to ovate-elliptic, apex short-acuminate, margins revolute, base rotund, midrib slightly raised on the upper surface, pilose, primary veins of 7–9 pairs, upper surface glabrous, lower surface rufus-tomentose, lamina 6.5–9.5 cm long, 4–5.5 cm wide. Petioles subterete, 2–3 cm, rufus-puberulent; rachis 1.5–2.5 cm; petiolules subquadrangular, rufus-puberulent, 4–5 mm. Stipules lanceolate, acute, 4–5 mm long, 2 mm wide, ciliate and strigose, densest toward apex; stipels linear, acute, 3–4 mm long, 0.5–1 mm wide, uncinate pubescent. *Inflorescence* axillary, solitary, racemose, few-flowered (2–4 flowered), subsessile to 0.8 cm long; axis densely rufo-puberulent. Pedicels 5–7 mm. Bracts lanceolate, acute, 5–7 mm long, 1.5–2 mm wide, pubescence uncinate, pilose, and more or less ciliate. Bracteoles lanceolate, acuminate, 13–14 mm long, 2.5–3 mm wide, inserted 2–3 mm below the calyx base, ciliate, densely

uncinate, and scattered pilose. *Flowers* medium-sized, ca 4.5 cm (slightly immature, probably becoming 5–6 cm). Calyx pubescence moderately dense, microtrichomes uncinate, macrotrichomes pilose, tube 15–17 mm long, 4–5 mm wide at the base to 7–9 mm wide at the throat, lobes lanceolate, acuminate, 9–11 mm long, 3–4 mm wide, ventral lobe linear, arcuate towards apex, 10–12 mm long. Vexillum pubescence appressed, tawny, blade 2.5 cm wide, claw 6 mm. Alae extended beyond the carina by 4 mm, blade spatulate, 20 mm long, 4–6 mm wide, claw 13 mm. Carina falcate, 12 mm long, 4 mm wide, claw 21 mm. Staminal tube 28 mm, incurved abruptly near apex, free filaments 2–4 mm; anthers lanceolate, 2 mm long, 0.7–0.8 mm wide, connective acute. Gynophore 4–5 mm, pubescent near apex yellowish-white; ovary 10 mm long, 1.2 mm wide, sericeous, white tinged yellowish; style greatly exceeding ovary length, 21 mm long, bearded, geniculate 5–6 mm from the distal end; stigma flattened, subcapitate, ca 0.7 mm diam. *Legume* unknown. Figure 2.

TYPE COLLECTION: BRAZIL. AMAZONAS: Vine, Río Negro, Içana, Serra de Tunuhy, 5 May 1947, *Fróes 22274* (HOLOTYPE: U 95456A).

Only two species in subgenus *Bractearia* have revolute leaf margins, *C. tunuhiensis* and its close relative *C. coriacea* (syn. *C. cerifera* Cowan). Both have similar appearances to the flowers, inflorescences, and leaves. *Clitoria coriacea* is distinguished easily by the shrubby habit, leaves with appressed trichomes and ceriferous on the lower surface, an impressed midrib on the upper leaf surface, and shorter bracteoles (5–11 mm). The margin of *C. coriacea* is strongly revolute, whereas the margin of *C. tunuhiensis* is weakly revolute. This new species is known only from the type locality.

3. CLITORIA plumosa Fantz, sp. nov.

Caules lignosi alti volubili, conspicuo rufotrichomatibus conferto. Folia trifoliata, *untrinque rufopubescentiae*, foliolis oblongis ad elliptico-oblongis, acuminatis. *Stipulae magnopere elongati, 2–3 cm.* Inflorescentiae prolati, 10–15 cm, multiflorae congestis inter conspicuos bracteos. Bracteae stipuloides, 13–16 mm. *Bracteolae magnopere elongati, 22–25 mm longi. Florae grandes maxime 7.5–9 cm. Calyx* tubo 27–30 mm *cum lobo ventrali plumosi, subulati, 23–28 mm, circa bis longitudine ceterosum.* Unguis petalorum prolati. Stylus elongatus, longitudine ovarium magnopero superantes. Legumen ignotum.

Liana, high growing into forest crown (teste *Haught 2075*), conspicuously and densely rufo-pubescent, trichomes spreading to erect, more or less stiff, 1.5–3 mm long. Branches 5–8 mm diam., hollow. *Leaves* 3-foliate, conspicuously rufo-pubescent on both surfaces, thick membranous, leaflets oblong to elliptic-oblong, apex obtuse, abruptly acuminate, acumen 0.5–1 cm long, to 4 mm wide, mucronate or with bristle tip of 3–6 mm, base broadly cuneate, midrib weakly raised on upper surface, primary veins of 10–12 pairs, lamina 9.5–16 cm long, 4–6 cm wide. Petioles angular-terete, 11–14 cm, conspicuously pubescent with spreading tawny-rufus trichomes; rachis

4–5 cm; petiolules quadrangular, 4–5 mm, pubesence of uncinate microtrichomes masked by the long, dense, macrotrichomes. Stipules highly elongated, conspicuous, persistent, narrowly oblong-lanceolate, narrowing into a long acumen, 19–29 mm long, 2–4 mm wide, ciliate with outer surface glabrate; stipels similar, terminal ones 8–15 mm long, 0.3–1 mm wide, lateral ones 12–20 mm long, 1–1.5 mm wide. *Inflorescence* cauliflorous, multiflowered, crowded; axis 10–15 cm long, conspicuously bracteated, pubescence of uncinate trichomes masked by the dense, rufus macrotrichomes. Pedicels 5–8 mm. Bracts stipule-like, 13–16 mm long, 2–4 mm wide, pubescence of uncinate microtrichomes with a few scattered macrotrichomes.

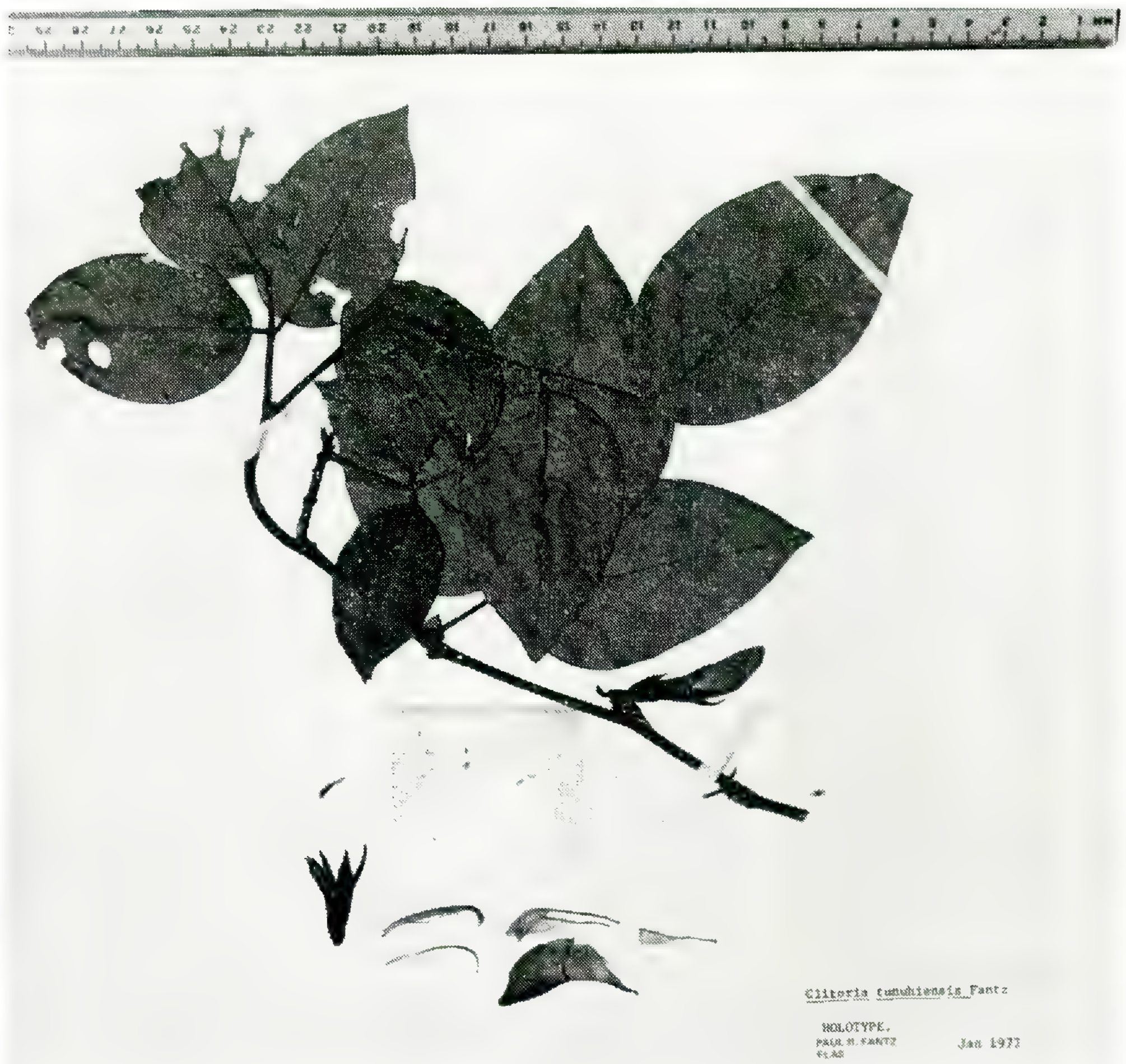

Figure 2. Holotype of *Clitoria tunuhiensis* (*Fróes 22274*, U).

Bracteoles highly elongated, stipule-like, long acuminate, base more or less attenuate, 22–25 mm long, 3–4 mm wide, pubescence ciliate with uncinate microtrichomes and scattered macrotrichomes. *Flowers* gigantic, 7.5–9 cm, corolla white (?—see discussion below) fading to yellow. Calyx pubescence dense, tawny-rufus, spreading, tube 27–30 mm long, 8–10 mm wide at the base expanding to 10–14 mm wide at the throat, lobes deltoid-lanceolate, rapidly narrowing to a long-acuminate apex, dorsal lobes 15–18 mm, lateral lobes 13–16 mm, ventral lobe highly elongated with a linear base and sub-ulate apex, plumose, 23–28 mm long, 0.3–1 mm wide. Vexillum pubescence glabrate to scattered uncinate, densest toward margins and base, blade 4.5–5 cm wide, claw 9–11. Alae extended beyond the carina by 6–8 mm, blade falcate-spatulate, 30–35 mm long, 5–10 mm wide, claw 23–26 mm. Carina falcate, blade 13–17 mm long, 6–8 mm wide, claw 34–38 mm. Staminal tube nearly straight, 49–53 mm long, free filaments 3–6 mm; anthers lanceolate, 2.7–3 mm long, 1 mm wide, connective apiculate. Gynophore subsessile; ovary 21–22 mm long, 1 mm wide, pubescence sericeous, white, spreading-ascending; style 31–33 mm long, bearded, geniculate 13–14 mm from the distil end; stigma capitate, flattened, 1 mm diam. *Legume* unknown. Figure 3.

TYPE COLLECTION: *COLOMBIA*. SANTANDER: Viscaina Creek, 32 km S of El Centro, vicinity of Barranca Bermeja, Magdalena Valley, between Sogamoso and Carare River, ca 100 m, 15 Nov 1936, *Haught 2075* (HOLOTYPE: UC $\overline{\text{M}}$ 049493; ISOTYPES: F 1450138, GH, NY).

This species is the only one in the genus which bears a highly elongated, plumose, ventral calyx lobe. Furthermore, the large, conspicuous stipules, bracts, bracteoles, and dense reddish-pubescent stems and leaves aid as a quick identification of this species. *Clitoria obidensis* is a closely related species distinguished by shorter stipules (6–11 mm), shorter inflorescence (to 1 cm), shorter bracts (6–11 mm), longer calyx lobes (20–27 mm), and shorter ovary (13–17 mm).

Haught described the flowers as light yellow flushed red. No other species of *Clitoria* is reported to have yellowed flowers. However, specimens of several other species have been collected that exhibit yellow flowers in the dried state. Some collectors have noted that these flowers were white fading to yellow. I suspect that the flowers of *C. plumosa* fit the same pattern, that they are white becoming yellowish with age.

Haught reported that he has seen the fallen flowers several times before, so the plant is not uncommon. Yet, as represented in herbarium collections, it is presently known only from the type locality.

Acknowledgement and appreciation is made to Robert L. Beckmann, James W. Hardin, and Jon M. Stucky for reviewing the manuscript and providing constructive criticisms.

PERU, Nov. 15, 1930.
Pipe-growing somewhat cauliflorous liane. Very showy light yellow flowers, flushed red, produced below leaf-bearing shoots, but in crown of forest. Not uncommon- have seen fallen flowers frequently, but this is first time found in place on plant. Vicosina Creek 32 km. south of El Centro at about 100 m. altitude.
PLANTS OF COLOMBIA
HERBARIUM OF THE UNIVERSITY OF CALIFORNIA
M 049493

Figure 3. Holotype of *Clitoria plumosa* (Holotype: *Haught 2075*, UC).

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ECOLOGICAL NOTES ON *JAMESIANTHUS ALABAMENSIS* BLAKE AND SHERFF (*ASTERACEAE*) AND AN HYPOTHESIS ON ITS ENDEMISM

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Jamesianthus is a monotypic genus of the Asteraceae (Figure 1). Specimens of the plant were first called to the attention of Dr. Roland Harper in September 1937 by Mr. Robert Leslie James, an amateur botanist, who sent to Harper for identification a specimen of a yellow-flowered composite he had collected along stream banks near his home in Franklin County, Alabama. Harper, thinking it was a species of *Coreopsis* he had collected previously, but had not identified, put the specimen aside. In October 1940, Harper first observed *Jamesianthus* in the field and, realizing it was different from anything he had seen, sent specimens to Drs. Sherff and Blake at the Field Museum of Natural History in Chicago (Harper, 1943). After careful examination of the two specimens sent them by Harper, they concluded that the material represented a new genus and named it *Jamesianthus alabamensis* in honor of Mr. James (Sherff, 1940).

According to Sherff (1940) the closest relative to *Jamesianthus* is *Arnicastrum*, a genus with a single species and dubious variety described by Greenman. The epappose ray-achenes and 20–35 unequal, hipidulous, persistent, capillary bristles of the disc-achenes distinguish *Arnicastrum* from *Jamesianthus*, which has 6–8 unequal, deciduous capillary bristles arising from a whitish collar. At the time (1940) specimens of both genera were exceedingly rare, with *Jamesianthus* being known from only two Alabama specimens and *Arnicastrum* from three Mexican collections in Chihuahua and Durango. *Arnicastrum* remains exceedingly rare and may even be extinct (Marshall Johnston, pers. comm.).

The only other references to *Jamesianthus alabamensis* in the botanical literature are a report of its chromosome number ($2n = 32$) by Johnson (1942), its inclusion in a list of Alabama endemics by Harper (1947), and its recent listings in Federal and State endangered species lists (U.S. Fish and Wildlife Service, 1975 and 1976; Thomas, 1976; Freeman et al., 1979). It was not included in any manual until the publication of Volume I, Asteraceae, of the Vascular Flora of the Southeastern United States (Cronquist, 1980). The present studies were initiated in September 1977 to determine the key elements in the life history of *Jamesianthus*, the extent and

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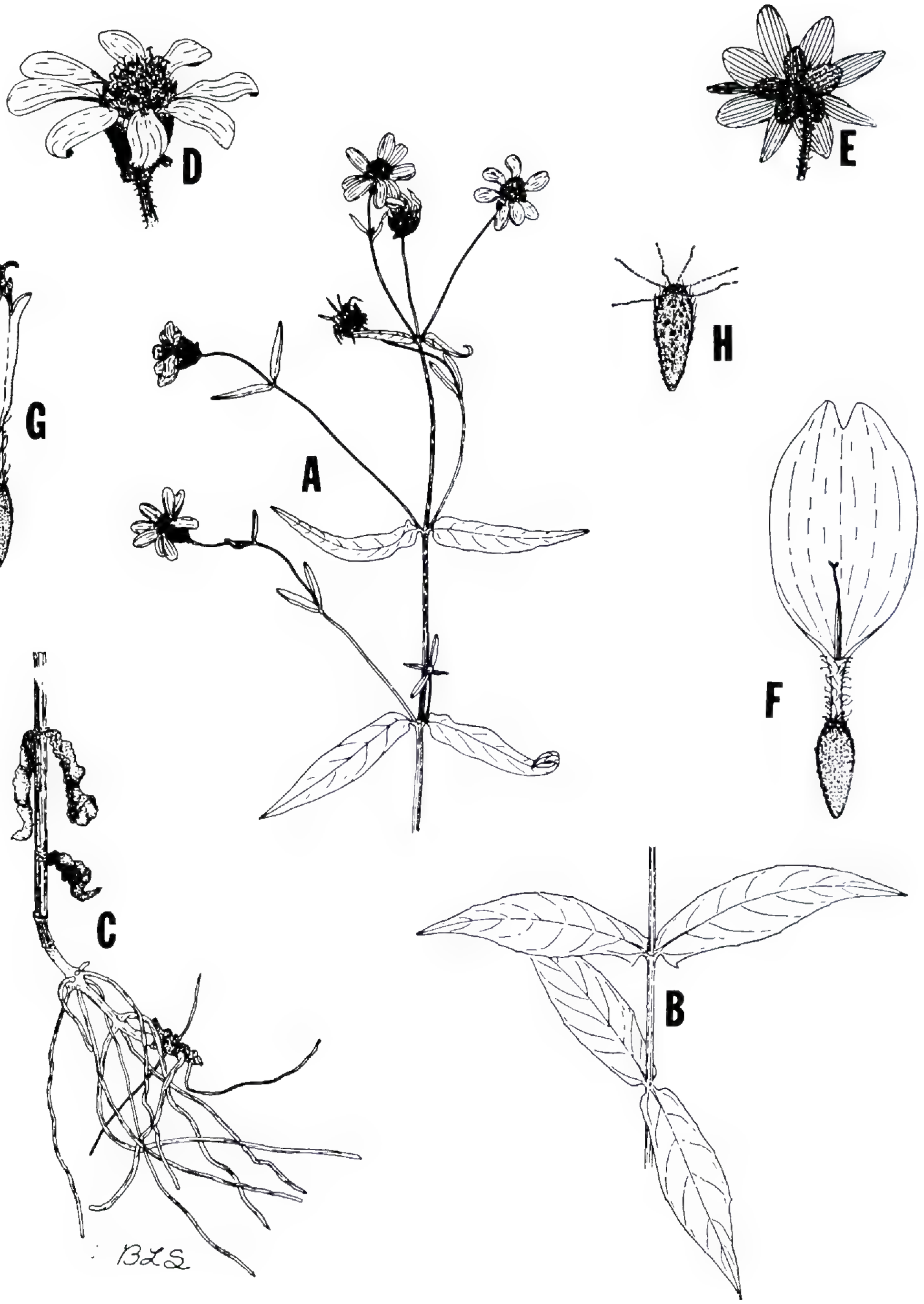

Fig. 1 *Jamesianthus alabamensis* A. Habit with flowers, X 4; B. Leaves, X 4; C. Base of plant, X 4; D. Head, X 16; E. Head with bracts, X 16; F. Ray flower, X 40; G. Disk flower, X 40; H. Achene, X 40.

condition of existing populations, and the factors contributing to its rarity.

Jamesianthus is a perennial species. All above ground parts begin to die back with the first killing frost, which usually occurs during the last week of October. Plants overwinter as conical buds on the fibrous rootstocks; no basal rosettes have been observed. Growth begins about the first of April as the conical buds unfold and small leafy rosettes appear. The stems elongate and vegetative growth continues through the spring and summer. Flower buds appear during July with anthesis beginning during mid-August and continuing until frost. The achenes mature during the late summer and fall. It appears that the perennating buds and achenes begin growth at the same time, as achenes planted in outdoor culture under ambient climatic conditions emerge at the same time as adjacent adult plants.

The habitat of *Jamesianthus* is found along the banks of small first- and second-order streams in an area known as the Little Mountain Formation. The stream beds are underlain by Hartselle standstone which is covered to varying degrees by deposits of Tuscaloosa gravels and sand. The pH of the streams range from 7.3 to 8.2 and the conductivity ranges from 225 to 270 μmhos. Sandstone streams typically are slightly acidic and the basic pH of the streams may be attributable to the limestone layer which overcaps the underlying sandstone. No plants of *Jamesianthus* have been found growing outside the riparian zone of these streams. In their natural state the streams would drain deciduous forests typical of the Interior Low Plateau physiographic province. Only second-growth forests remain and some areas along these streams have been cleared for cropland or pasture. *Jamesianthus* grows in both shaded and open areas, but seems to prefer partial shade. The woody canopy of the streams is composed of *Platanus occidentalis* L., *Acer negundo* L., *Liriodendron tulipifera* L., *Fagus grandifolia* Ehrh., *Acer rubrum* L., and *Fraxinus pennsylvanica* Marsh.; the subcanopy of *Cornus amomum* Mill., *Alnus serrulata* (Ait.) Willd., *Hamamelis virginiana* L., *Salix nigra* Marsh.; and *S. caroliniana* Michx.; and notable herbaceous associates include *Carex torta* Boott, *Chelone glabra* L., *Coreopsis tripteris* L., *Equisetum hyemale* L., *Helenium autumnale* L., *Helianthus microcephalus* T. & G., *Iris verna* L., *Justicia americana* (L.) Vahl, *Plantago cordata* L., *Rudbeckia fulgida* Ait., *R. hirta* L., *R. triloba* L., and *Verbesina virginica* L.

The extent of the distribution of *Jamesianthus* was determined by beginning at its type locality, four miles northwest of Russellville, and searching streams in northwestern Alabama and contiguous areas in northeastern Mississippi and southern Tennessee. No plants of *Jamesianthus* have been found further than six miles from its type locality, and most of the plants were within an area three miles on either side of the Colbert/Franklin County line northwest of Russellville. On a survey conducted September 10, 1980, the number of plants per 100 m of stream at seven localities varied from 20 to 100, with the median being 50. The number of plants of

Jamesianthus per 100 m of stream decreases with distance from the center of its distribution. In each of the seven localities there appears to be various age classes of plants present, indicating that the populations are viable and reproducing.

Why is *Jamesianthus* endemic to this small area of northwestern Alabama? Of the four types of endemism (paleoendemics, insular endemics, neoendemics, ecological endemics) discussed by Daubenmire (1978). *Jamesianthus* could best be explained as an ecological endemic. The geological habitat in which it occurs is unique. Three geological formations (Hartselle sandstone, Banger limestone, and Tuscaloosa gravel) outcrop in this region, coinciding with the range of *Jamesianthus*. The Tuscaloosa gravels are the youngest, overlapping Bangor limestone which overlies Harselle sandstone which rests upon other layers of limestone (Harris et al., 1963). In essence, there is a layer of standstone exposed which is sandwiched between two layers of limestone. It is in the area where the small headwater streams have cut through the top layer of limestone to the sandstone, and into which gravels and sandy deposits of the Tuscaloosa group have washed, that *Jamesianthus* occurs. The streams cut back into limestone as they proceed in any direction from this sandstone region. Therefore, *Jamesianthus* is restricted to the streams of a small sandstone outlier.

Even though the distribution of *Jamesianthus* is limited to these small geologically unique streams of northwestern Alabama, its present restriction to this area cannot be explained on the basis of a narrow ecological amplitude and affinity for this particular habitat. Transplant studies over the past three years have demonstrated that *Jamesianthus* will grow perfectly well, flower and produce viable achenes is a variety of habitats from upland open pine to deciduous woods. Also germination experiments have shown that achenes will germinate with or without stratification in a pH range from 4 to 9 on such varied substrates as wet filter paper, peat, potting soil, and dolomite. The germination percentage in most tests was slightly greater than 30 percent.

It is believed that the present factor limiting the distribution of *Jamesianthus* is dissemination to suitable habitat. The achenes of *Jamesianthus* have only a deciduous pappus of capillary bristles. Therefore they are not suited for dissemination by animals or wind. They will float for short periods, and this appears to be its means of dispersal. As discussed previously, *Jamesianthus* is found only on the banks of small first- and second-order streams. As these are headwater streams which change in size, depth, flow and bank characteristics, it may be that habitat for successful establishment of the floating achenes downstream is simply lacking.

It is therefore proposed that *Jamesianthus* is an ecologic endemic that arose as Daubenmire (1978) states "through the rare concomitance of a mutation or hybridization producing an individual preadapted to an environ-

ment different from that of the parent stock(s)." The parent stock of *Jamesianthus* was conceivably widespread at one time, probably giving rise to both *Jamesianthus* and *Arnicastrum*, but for some reason has long since become extinct. The particular genetic characteristics that once restricted *Jamesianthus* to its unique niche and separated it from the parental stock apparently have been altered or lost, but it continues to be restricted due to lack of an effective dissemination mechanism.

ACKNOWLEDGMENTS

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A POPULATIONAL STUDY OF THE EXOMORPHIC VARIATIONS IN *VICIA MINUTIFLORA* DIETR. INCLUDING *V. REVERCHONII* WATS. (LEGUMINOSAE)

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The taxonomic status of *Vicia reverchonii* Wats. has been in question for some time. It has been regarded both as a distinct species (Hermann, 1960) and as a form of *V. minutiflora* Dietr. (Shinners, 1948).

Vicia reverchonii was first collected in sandy soils of Dallas, Texas by Julien Reverchon in 1877. It was named and described by Sereno Watson in 1879 (GH). It was collected again in 1940 by William McCart, one mile south of Denton County, Texas. And it has been mentioned that it was collected in Wewoka, Oklahoma (Hermann, 1960) but there's no verification in herbarium records or in the field that it indeed had been collected there.

Shinners (1948) designated *V. reverchonii* as a form of *V. minutiflora* (*V. minutiflora* f. *reverchonii* (S. Wats.) Shinners). Turner (1959) agreed with Shinners' determination and published it as such in *The Legumes of Texas*. Hermann (1960), however, differentiated between *V. minutiflora* and *V. reverchonii* by legume and calyx pubescence, peduncle length, and calyx lobe length and shape. Correll and Johnston (1970) adopted Hermann's treatment as a distinct species. Shelter and Skag (1978) and Kartesz and Kartesz (1980) both regarded *V. reverchonii* as a synonym of *V. minutiflora*.

Flowers from herbarium specimens of *V. minutiflora* were observed to possess glabrous to densely pilose ovaries (Mahler, 1977, annotated 23 specimens as *V. reverchonii*, based on pubescent ovaries, out of 55 sheets previously labeled *V. minutiflora*). Also, the calyx, corolla, and shape and texture of the pods were thought to be typical of *V. minutiflora* (Shinners, 1948). Considering the morphological overlap, a study was initiated:

1) to determine the amount of variation in pubescence of ovaries and mature legumes of *V. minutiflora*, as well as the amount of variation in the other key characteristics;
2) to determine if *V. reverchonii* fits into the normal range of variation of *V. minutiflora*;
3) to determine if there was an ecological mechanism for the variation.

SIDA 9(3): 215–222. 1982.

METHODS AND MATERIALS

Fifteen counties in north central Texas and eight counties in south central Oklahoma were investigated to locate populations of *V. minutiflora* and *V. reverchonii*. Twenty populations of *V. minutiflora* were located; however, none of the previously reported populations of *V. reverchonii* was located. See Figure 1.

Random collections were made at each site during March, April and May 1981. Specimens varied from flowering only, to flowering and fruiting, to fruiting only. Morphological characteristics were measured from 100 of these specimens and from 22 SMU herbarium specimens.

Ten key characteristics used to delimit the taxa (Hermann, 1960; Gunn, 1968) were studied. A comparison of the two species as found in Hermann (1960) and Gunn (1968) is found in Table 1.

The ten morphological characters examined on each specimen are listed in Table 2 along with the measurements used. For each character under investigation, five different measurements were randomly made on each plant specimen. This enabled me to see the variation of these characters, not only within the populations, but also on a given plant. A scale of ovary and legume pubescence was devised for the assessment of degree of pubescence: 1—Glabrous, 2—Scarce, 3—Moderate, 4—Abundant. See Figure 2 for relative pubescence.

Pollen grains were studied for taxonomically significant differences. Flowers were removed from specimens and acetolyzed as described in Erdtman (1960). Only one specimen of *V. reverchonii* (*McCart 1989*) was used for examination, while nine specimens of *V. minutiflora* was studied.

The herbarium specimens of *V. reverchonii* and *V. minutiflora* examined for variation and the specimens collected in the field for this study are on file at SMU.

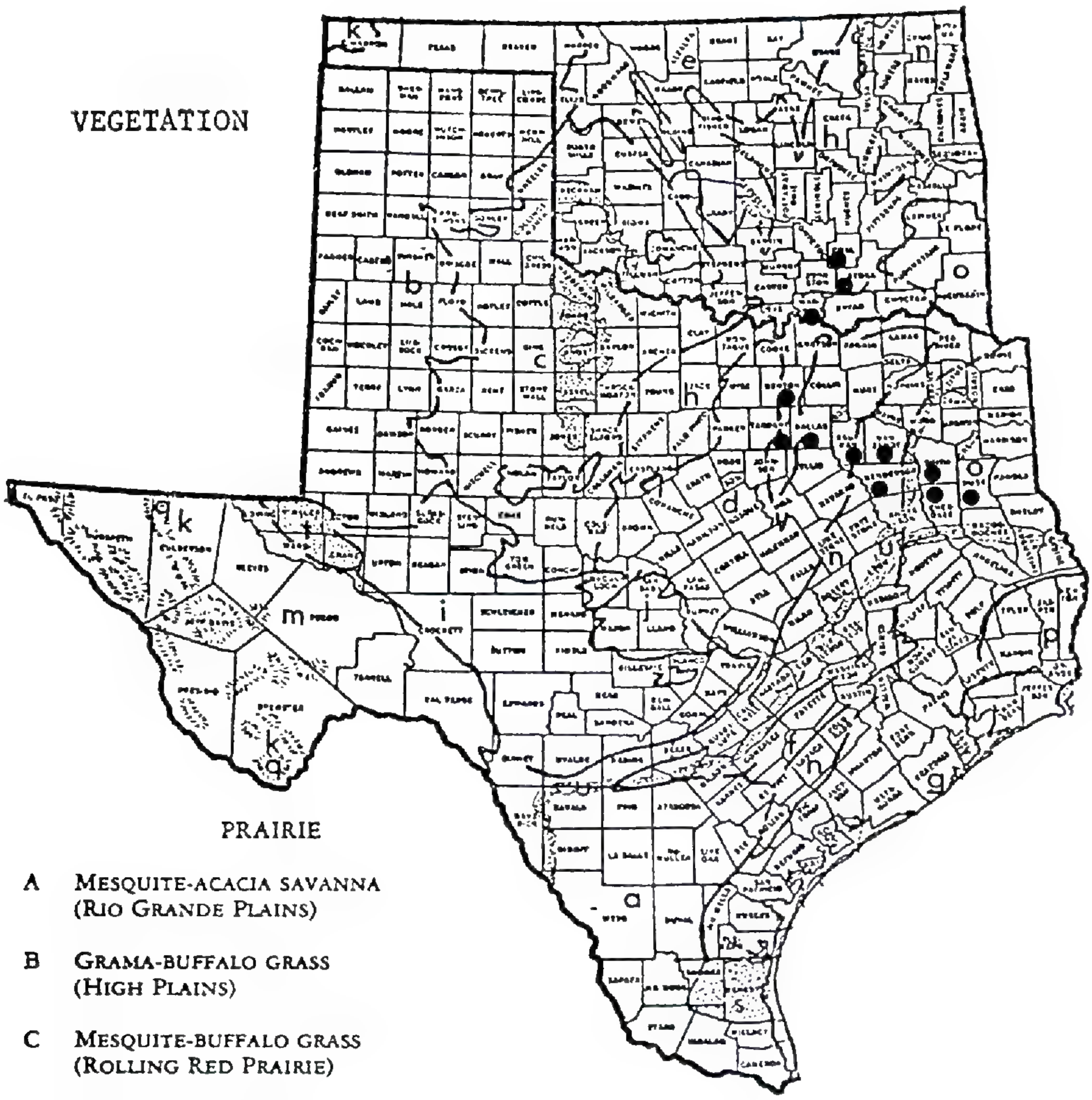
RESULTS AND DISCUSSIONS

Figure 3 exhibits the ranges for the ten characteristics observed on *V. minutiflora* and *V. reverchonii* specimens. Although these data are from 120 specimens of the former and only 2 of the latter, in most cases, the characteristics used by Hermann (1960) to delimit *V. reverchonii* still fall within the extent of variation found in the mass collection of *V. minutiflora*. Therefore Hermann's diagnostic ranges are also included in Figure 3.

The number of leaflets per leaf varied on *V. minutiflora* from 4 to 9 and on *V. reverchonii* from 4 to 6. These data contradict Hermann's (1960) findings. Hermann's range for *V. minutiflora* was 4 to 6 leaflets; for *V. reverchonii*, (4) 6 to 10. There appears to be a definite overlap in the range of variation for the number of leaflets per leaf.

Figure 1. Counties in Texas and Oklahoma within which 20 populations of *V. minutiflora* were studied.

VEGETATION



PRAIRIE

A MESQUITE-ACACIA SAVANNA
(RIO GRANDE PLAINS)

B GRAMA-BUFFALO GRASS
(HIGH PLAINS)

C MESQUITE-BUFFALO GRASS
(ROLLING RED PRAIRIE)

D BLUESTEM-NEEDLEGRASS
(BLACKLAND PRAIRIE)

E BLUESTEM-GRAMA GRASS
(NORTH CENTRAL OKLAHOMA)

F BLUESTEM-BUFFALO GRASS
(FAYETTE PRAIRIE)

G BLUESTEM-SACAHUISTA
(GULF COASTAL PRAIRIE)

WOODLAND

H OAK-BLUESTEM
(E & W CROSS TIMBERS-TEXAS;
CROSS TIMBERS-OKLAHOMA)

I JUNIPER-OAK SAVANNA
(EDWARDS PLATEAU)

J MESQUITE-OAK SAVANNA
(LLANO BASIN)

K PINYON-JUNIPER
(BLACK MESA & TRANS-PECOS MTNS.)

M CREOSOTE BUSH-SHRUB
(TRANS-PECOS BASINS)

FORESTS

N OAK-HICKORY
(E TEXAS & NE OKLAHOMA)

O OAK-HICKORY-PINE
(E TEXAS & SE OKLAHOMA)

P BEECH-MAGNOLIA-PINE-OAK-SWEET GUM
(BIG THICKET)

Q PINE-DOUGLAS FIR
(TRANS-PECOS MTNS.)

DEEP SAND

R SHINNERY
(N TEXAS & SW OKLAHOMA)

S MESQUITE-LIVE OAK SAVANNA
(RIO GRANDE PLAINS)

T SAND DUNES
(S HIGH PLAINS)

U CARRIZO, SPARTA, & QUEEN CITY SANDS

TABLE 1. Comparison of Key Characteristics

	Vicia minutiflora	*Vicia reverchonii*
* Leaflets per leaf	4–6	(4) 6–10
* Leaflet Width		3–7 mm
* Leaflet Length (including lower leaves)	5–35 mm	5–17 mm
* Calyx Lobe Length	0.5–1 mm	2 mm
* Calyx Lobe Shape	Deltoid	Lanceolate
* Calyx Tube Pubescence	Sparsely villous	Villous
* Peduncles in Fruit	2 cm	3 cm
* Legume Pubescence	Glabrous	Appressed villous
† Ovule Number	4–*8*–12	11–*12*–13
† Standard Length	4–6–8	5–6–7

* from Hermann, 1960
† from Gunn, 1968

TABLE 2. Characters Examined on Herbarium and Mass Collection Specimens

Morphological Characters	*Means of Measurement*
Leaves:	
1. Leaflets per Leaf	Number
2. Leaflet Width	Mm
3. Leaflet Length	Mm
Flowers and Fruits:	
4. Calyx Lobe Length	Mm
5. Calyx Lobe Shape	Deltoid or lanceolate
6. Peduncle Length in Fruit	Mm
7. Legume Pubescence	see Figure 2
8. Ovary Pubescence	see Figure 2
9. Ovule Number	Number
10. Standard Length	Mm

The leaflet width for *V. minutiflora* exhibited a range from 0.5 mm to 5 mm. A range of 2.5 mm to 4 mm was observed for *V. reverchonii*. Again this coincides. If one considers Hermann's range of leaflet width for *V. reverchonii* (3 mm to 7 mm), it would be clear that this overlaps the upper portion of the range found for *V. minutiflora*.

The leaflet length for *V. minutiflora* varied from 6 mm to 36 mm and for *V. reverchonii* from 8 mm to 15 mm. Overlapping of the ranges for leaflet length is shown in these data, as well as in Hermann's data. Hermann's range for *V. minutiflora* (including the lower leaves) was 5 mm to 35 mm and for *V. reverchonii* was 5 mm to 17 mm.

Figure 2. Scale of legume and ovary pubescence: 1) glabrous, 2) scarce, 3) moderate, 4) abundant.

The calyx lobe length was measured and a range of 0.5 mm to 1.8 mm was obtained for *V. minutiflora. Vicia reverchonii* specimens displayed a range of 2 mm to 3 mm. This was one of the two characteristics which demonstrated no overlapping between the taxa. However, the calyx lobe shape did exhibit an overlap. In fact, there were many *V. minutiflora* specimens with both deltoid and lanceolate lobes on the same calyx. In Figure 2, lanceolate lobes were designated as 1 and deltoid lobes as 2 The *V. reverchonii* specimens showed no range between lanceolate and deltoid.

Examination of the peduncle length in fruit shows a range of variation for *V. minutiflora* of 9 mm to 38 mm, which included the range obtained for *V. reverchonii* (12 to 22 mm).

The variation in legume pubescence showed some overlap, with *V. minutiflora* measuring glabrous to moderately abundant (1–3.5 on Figure 2) and *V. reverchonii* measuring moderate to abundant (3–4 on Figure 2). It was found that the pubescence varied not only from plant to plant within the populations but also on a given plant.

The ovary pubescence showed no overlap. *Vicia minutiflora* exhibited a range from glabrous to moderately abundant (1–3.5 on Figure 2). *Vicia reverchonii* exhibited an abundant pubescence (4 on Fgure 2). It was observed that there was a general trend from hairy ovaries to less hairy legumes in *V. minutiflora.* An attempt was made to find a correlation between pubescence and aridity of the habitat or pubescence and east-west vegetational zones. Unfortunately, no correlations could be made from the data at this point, but that does not preclude the possibility of correlations.

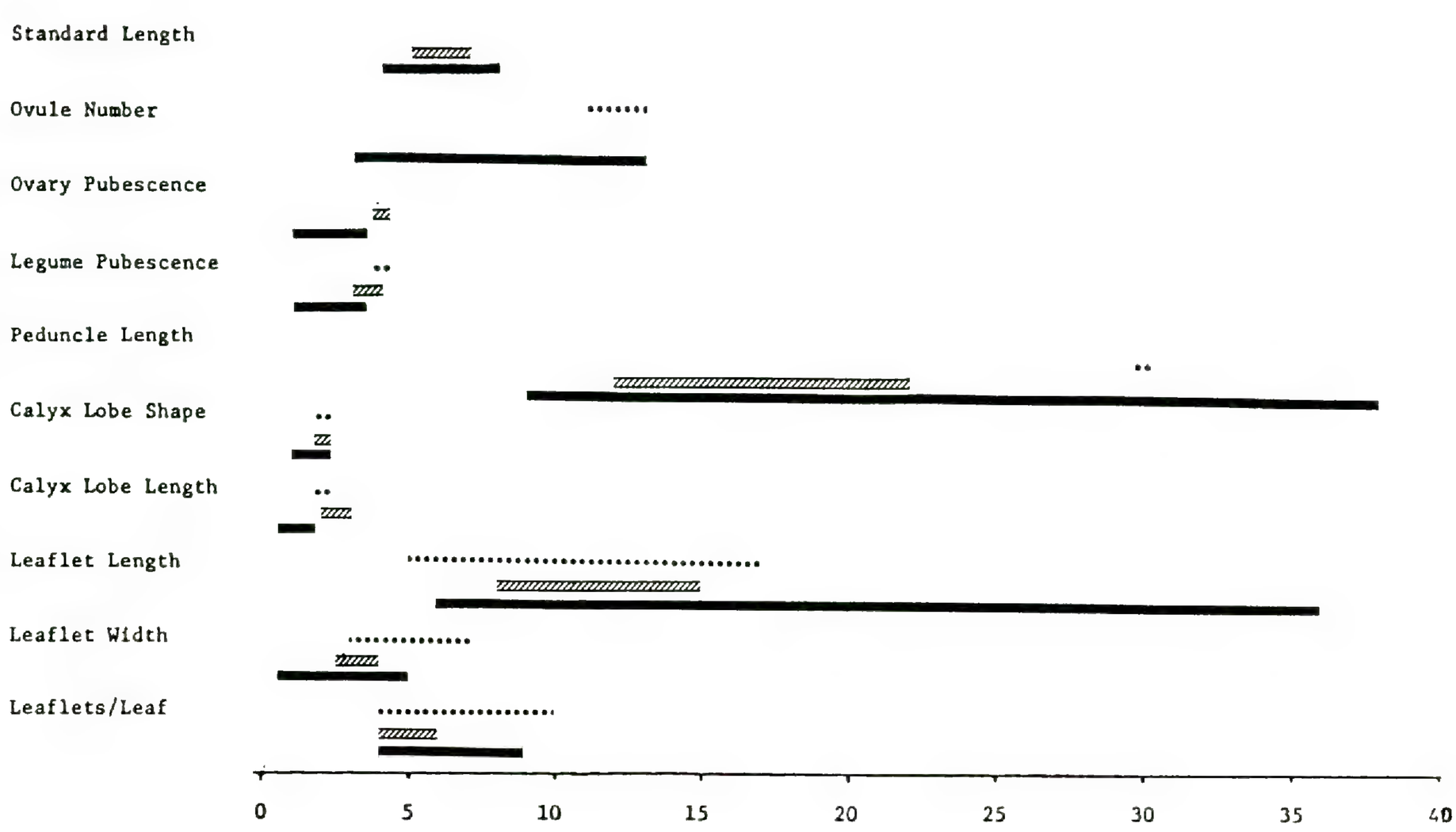


Figure 3. Range of each characteristic examined.

The ovule number for *V. minutiflora* varied from 3–13. Although no ovule number was determined from the *V. reverchonii* specimens which were examined, Gunn (1968) indicated the ovule number to be 11–*12*–13, which falls within the range obtained for *V. minutiflora.*

Gunn (1968) determined the standard length for *V. minutiflora* to be 4 mm to 8 mm and for *V. reverchonii* to be 5 mm to 7 mm. Gunn's data are in agreement with the ranges found for this study. *Vicia reverchonii* falls well within the range of variation of *V. minutiflora.*

From the above data eight of the ten characteristics of *V. reverchonii* were found to fall well within the ranges of variation for *V. minutiflora.* Those which didn't fall within the ranges were close enough essentially to be considered on the extremes of the ranges. For example, calyx lobe length on *V. minutiflora* was 0.5–1.8 mm whereas on the *V. reverchonii* specimens it was found to be 2–3 mm. The ovary pubescence on *V. minutiflora* had a range of 1–3.5 and measured 4 on *V. reverchonii* specimens. In both cases the values found on the *V. reverchonii* specimens appear to be an extension of the calyx lobe length range and the ovary pubescence range.

From the study conducted the majority of the population was found to have pubescence on the ovaries and on the mature pods. The extremes of this range of pubescence are glabrous and densely pubescent. If one were to regard *V. reverchonii* as a distinct form because of its dense pubescence then there should be 2 other forms designated for the other variations of pubescence—a less pubescent form and a glabrous form.

Therefore the above data indicate that *V. reverchonii* is not a distinct species and should be recognized as one extreme within the variation of *V. minutiflora.*

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NOMENCLATURAL CHANGES AND CLARIFICATIONS IN MEXICAN *ERIGERON* (ASTERACEAE)

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ABSTRACT

Two new names and seven new combinations are proposed in species of *Erigeron* previously classified as *Achaetogeron*. For ten validly named *Erigeron* species to which names as *Achaetogeron* have been applied, synonymies are given. An index is presented to the current disposition of all names in *Achaetogeron*.

As in many other genera of the Astereae as well as of the whole family, variation in pappus production exists among species of *Erigeron*. For example, the achenes of *E. mimegletes* Shinners are epappose, those of *E. philadelphicus* L. pappose. In *E. annuus* (L.) Persoon the ray achenes are epappose but the disc achenes pappose; in *E. narcissus* Nesom the disc achenes are epappose, the ray achenes pappose. The genus *Achaetogeron* A. Gray has been maintained as distinct from *Erigeron* by a loose and unstudied consensus solely on the basis of its paucity or lack of pappus bristles; however, evolutionary loss of pappus has occurred independently at least six times within *Erigeron* (Nesom, 1980). A number of the taxa described as *Achaetogeron* were early transferred to *Erigeron* by E. L. Greene (1891), and I am transferring the remainder of the taxa that I consider worthy of recognition.

Several papers in preparation will present systematic studies of the groups including epappose species and will report new species, comparative morphology (including illustrations) and geography, chromosome numbers, phylogenetic hypotheses, and classifications of the species involved. I am here validating the following new names and combinations as well as clarifying synonymies in order that they may be validly and correctly used in studies of Mexican floristics.

NEW NAMES

1. ERIGERON **janivultus** Nesom, comb. et nom. nov.

   Achaetogeron linearifolius S. Watson, Proc. Amer. Acad. Arts 26:139. 1891. TYPE: MEXICO. MEXICO: bluffs and plains near Flor de Maria, 4 Sep 1890, *C. G. Pringle 3242* (HOLOTYPE: GH!; ISOTYPES: CM! ENCB!, MEXU 2 sheets!, MSC!, NY!, PH, UC 2 sheets!, US 2 sheets!).

   Achaetogeron ascendens Greenman, Proc. Amer. Acad. Arts 41:254. 1905. TYPE: MEXICO. HIDALGO: meadow near Buena Vista Station (Cuyamaloza, Sierra de

SIDA 9(3): 223–229. 1982.

Pachuca), 2490 m (8300 ft), 4 Aug 1904, *C. G. Pringle 8851* (HOLOTYPE: GH!; ISOTYPES: CM!, ENCB!, MEXU 2 sheets!, NMC!, NY!, PH, UC!, US 2 sheets!).

The first *Achaetogeron* epithet is occupied in *Erigeron* as *E. linearifolius* Cavanilles. *Erigeron adscendens* Turczaninow was described in 1851; thus, to avoid confusion I have chosen a new name for this species, especially since one of Pringle's collections was distributed with incorrectly printed labels as *Achaetogeron adscendens*. The new epithet refers to the countenance of Janus.

2. ERIGERON **narcissus** Nesom, comb. et nom. nov.

Achaetogeron filiformis Larsen, J. Wash. Acad. Sci. 38:199. 1948. TYPE: MEXICO. TAMAULIPAS: vicinity of Tampico, 15 m, 10 Mar-19 Apr 1910, *E. Palmer 249* (HOLOTYPE: MO!; ISOTYPES: CAS!, DS!, UC!, US!).

The *Achaetogeron* epithet is occupied in *Erigeron* as *E. filiformis* Sprengel.

3. ERIGERON **griseus** (Greenman) Nesom, comb. nov.

Achaetogeron griseus Greenman, Proc. Amer. Acad. Arts 41:254. 1905. TYPE: MEXICO. DURANGO: vicinity of the city of Durango, Apr-Nov 1896, *E. Palmer* 821 (HOLOTYPE: GH!; ISOTYPES: UC!, US!).
Bellis garciae Blake, Contr. U. S. Natl. Herb. 22:593. 1924. TYPE: MEXICO. DURANGO: state of Durango, 1000 m, *P. Ibaña Garcia 310* (HOLOTYPE: US!). *Achaetogeron garciae* (Blake) Larsen, J. Wash. Acad. Sci. 38:201. 1948.

4. ERIGERON **guatemalensis** (Blake) Nesom, comb. nov.

Astranthium guatemalense Blake, Brittonia 2:335. 1937. TYPE: GUATEMALA: in open pine woods, along trail between Huehuetenango and Soloma, Sierra Cuchumatanes, Dept. Huehuetenango, 3355 m, 15 Sep 1934, *Skutch 1239* (HOLOTYPE: GH!; ISOTYPES: F, LL!, NY!, US!). *Achaetogeron guatemalense* (Blake) De Jong, Publ. Mus. Michigan State Univ., Biol. Ser. 2:489. 1965.

5. ERIGERON **mimus** (Blake) Nesom, comb. nov.

Bellis mima Blake, Contr. U. S. Natl. Herb. 22:594. 1924. TYPE: MEXICO. DURANGO: Sierra Madre 48 km (30 mi) N of Guanacevi, 2400-2700 m (8000-9000 ft), 18 Aug 1898, *E. W. Nelson 4786* (HOLOTYPE: US!; ISOTYPE: GH!). *Astranthium mimum* (Blake) Larsen, Ann. Mo. Bot. Gard. 20:30. 1933. *Achaetogeron mimus* (Blake) De Jong, Publ. Mus. Michigan State Univ., Biol. Ser. 2:490. 1965.

6. ERIGERON **polycephalus** (Larsen) Nesom, comb. nov.

Achaetogeron polycephalus Larsen, J. Wash. Acad. Sci. 38:200. 1948. TYPE: MEXICO. DURANGO: San Ramón, 21 Apr-18 May 1906, *E. Palmer 52* (HOLOTYPE: MO!; ISOTYPES: CM!, UC!, US!).
Achaetogeron corymbosus Larsen, J. Wash. Acad. Sci. 38:201. 1948. TYPE: MEXICO. JALISCO: canyons, moist rocks, Tuxpan, Feb 1904, *C. A. Purpus 527* (HOLOTYPE: GH!; ISOTYPE: UC!).

The long-accepted name for *Erigeron polycephalus* has been *E. leucanthe-*

mifolius S. Schauer (Linnaea 19:723. 1847.). The type of the latter species was collected in about 1845 by a German physician and traveller in Mexico, Alwin Aschenborn. From his collections of about 750 numbers, over 100 new species have been named. Although scattered collections of Aschenborn are now housed in K, P, and at least were present in B before World War II, the largest set now appears to be in the Herbarium of Wroclaw University (WRSL), Poland. An analysis of all the Types there is in progress. A preliminary analysis of Aschenborn's itinerary shows that most of his collections were made from the valley of Mexico or the high mountains immediately to the west of it. The species from the Sierra Madre Occidental long known as *E. leucanthemifolius* has never been collected so far to the east, and the 2 sheets of the type collection of *E. leucanthemifolius* examined from Wroclaw actually are *Erigeron karvinskianus* DC. (Prodr. 5:285. 1836.). Of the two names applied as *Achaetogeron* to this species, one is already occupied in *Erigeron* as *E. corymbosus* Nuttall.

7. ERIGERON **subacaulis** (McVaugh) Nesom, comb. nov.

Achaetogeron subacaulis McVaugh, Contr. Univ. Michigan Herb. 9:361. 1972. TYPE: MEXICO. AGUASCALIENTES: Sierra del Laurel, near the Jalisco border, ca 15–16 km (10 mi) SE of Calvillo, above Rancho de los Adobes, in oak forest, 2500–2700 m, 26–28 Aug 1960, *McVaugh 18434* (HOLOTYPE: MICH!; ISOTYPES: DUKE!, ENCB!, LL!, MICH!, NY!, US!).

8. ERIGERON **versicolor** (Greenman) Nesom, comb. nov.

Achaetogeron versicolor Greenman, Proc. Amer. Acad. Arts 41:255 1905. TYPE: MEXICO. HIDALGO: meadows near Buena Vista Station, 2490 m (8300 ft), 7 Aug 1904, *C. G. Pringle 8849* (HOLOTYPE: GH!; ISOTYPES: ARIZ!, ASU!, CM!, DUKE!, ENCB!, LL 2 sheets!, MEXU 2 sheets!, NMC!, PH, POM!, NY!, SMU!, TEX!, UC!, US 2 sheets!).

9. ERIGERON WISLIZENI (A Gray) Greene ssp. **purpurascens** (Greenman) Nesom, comb. et stat. nov.

Achaetogeron purpurascens Greenman, Proc. Amer. Acad. Arts 39:94. 1903. TYPE: MEXICO. CHIHUAHUA: Sierra Madre, near Colonia Garcia, 2400 m (8000 ft), 27 Jul 1899, *C. H. T. Townsend and C. M. Barber 175* (HOLOTYPE: GH!; ISOTYPES: NY!, MICH!, PH!, UC!, UNM 2 sheets!, US 2 sheets!).

CLARIFICATIONS OF SYNONYMY

10. ERIGERON CORONARIUS Greene

Erigeron coronarius Greene, Pittonia 2:167. 1891. TYPE: MEXICO. CHIHUAHUA: pine plains, base of the Sierra Madre, 3.2–4.8 km (2–3 mi) S of Guerrero, 27 Sep 1887, *C. G. Pringle 1275* (HOLOTYPE: US!; ISOTYPES: GH!, MEXU!, NY!, PH!).

Erigeron howardi M. E. Jones, Contr. W. Bot. 12:45. 1908. TYPE: MEXICO. CHIHUAHUA: Colonia Juarez, Sierra Madre Mts., 1800 m (6000 ft), 12 Sep 1903, *M. E. Jones s.n.* (HOLOTYPE: POM 37622!, photo at US!). *Achaetogeron*

howardi (M. E. Jones) Blake, Contr. U.S. Natl. Herb. 29:127. 1945.

11. ERIGERON DELPHINIFOLIUS Willdenow

Erigeron delphinifolius Willdenow, Enum. Hort. Berol. 2:873. 1809. TYPE: in America meridionali, *Humboldt and Bonpland s.n.* (HOLOTYPE: B not seen, drawing by Klatt in GH!). *Diplopappus delphinifolius* (Willdenow) Cassini, Dict. Sci. Nat. 25:96. 1822. *Stenactis delphinifolius* (Willdenow) Cassini, Dict. Sci. Nat. 50:483. 1827. *Polyactis delphinifolia* (Willdenow) Lessing, Syn. Comp. 189. 1832. *Polyactidium delphinifolium* (Willednow) DC., Prodr. 5:282. 1836. *Erigeron delphinifolius* Willdenow subsp. *delphinifolius* (Cronquist in Brittonia 6:263. 1947).

I recognize no infra-specific taxa within *E. delphinifolius.*

Achaetogeron fisheri Larsen, J. Wash. Acad. Sci. 38:200. 1948. TYPE: MEXICO. MEXICO: Amecameca, 2700 m (9000 ft), 29 Jul 1924, *C. L. Fisher s.n.* (HOLOTYPE: MO 914802!; ISOTYPE: ARIZ!).

Achaetogeron sophiaefolius Larsen, J. Wash. Acad. Sci. 38:200. 1948. TYPE: MEXICO. DURANGO: city of Durango and vicinity, Apr-Nov 1896, *E. Palmer 158* (HOLOTYPE: MO!; ISOTYPES: MEXU!, NY!, UC 2 sheets!, US!).

12. ERIGERON FORRERI (Greene) Greene

Achaetogeron forreri Greene, Pittonia 1:155. 1888. TYPE: MEXICO. DURANGO: from the Sierra Madre W of Durango, 2430 m (8100 ft), Sep and Oct 1881, *A. Forrer 110*[a] (HOLOTYPE: UC!; ISOTYPES: GH!, PH, NY!, UC!, US!). *Erigeron forreri* (Greene) Greene, Pittonia 2:169. 1891.

The Holotype at UC has no collection number besides the printed "A. Forrer", but the number "33." is penned in the lower left-hand corner of the label. The UC Isotype bears no numbers on the label. Each of the other Isotypes I have seen has "110[a]" penned beside "A. Forrer". The labels on all the sheets are identical, with printed information. The plants on all the sheets are very similar in size and morphology, and it seems likely that all of them are from the same collection.

13. ERIGERON FRATERNUS Greene

Achaetogeron affinis A. Gray, Proc. Amer. Acad. Arts 21:386. 1886. TYPE: MEXICO. CHIHUAHUA: at the Frailes, about mid-height of the mountains above Batopilas, in shade under trees, Oct 1885, *E. Palmer 255* (HOLOTYPE: GH!; ISOTYPES: MEXU!, NY 2 sheets!, PH, US 2 sheets!). *Erigeron fraternus* Greene (nomen novum), Pittonia 2:169. 1891.

Erigeron tenuicaulis M. E. Jones, Contr. W. Bot. 12:44. 1908. TYPE: MEXICO. CHIHUAHUA: hillsides E of Hop Valley, Sierra Madre Mts., 2100 m (7000 ft), in the Middle Temperate Life Zone, Sep 1903, *M. E. Jones s.n.* (This collection not located.). NEOTYPE—POM 39223! and ISO-NEOTYPE—POM 39221! designated here (MEXICO. CHIHUAHUA: mesa, W of Soldier Canyon, Sierra Madre Mts., 2100 m (7000 ft), 16 Sep 1903, *M. E. Jones s.n.*)

The epithet *fraternus* was applied by E. L. Greene as a *nomen novum* when he transferred *Achaetogeron affinis* to *Erigeron.* Five years later, in spite of his caustic references to earlier repetition of epithets in *Erigeron*,

he published the descriptions of another *Erigeron fraternus*, based on a different Type, considered by Cronquist (1947) to be a synonym of *E. glabellus*. *Erigeron tenuicaulis* is a heterotypic synonym of *E. fraternus*. The collection data cited by Jones for the Type collection of *E. tenuicaulis* are specific, but Blake (1945) observed that such a collection could not be found in the Pomona College Herbarium. However, he cites two sheets from Pomona "which agree so closely with Jones' rather careful description that I have little doubt that they are the actual collections cited and that the discrepancy in data is due merely to a different way of describing the locality". These two sheets are labeled as being collected in "Soldier Canyon". I agree with Blake that these plants match the description of Jones' cited collections from east of Hop Valley, but since printed labels on other of his collections from 17 Sep 1903 specify the location "W of Hop Valley", it seems possible that the Type collection actually has been lost. Judging from other printed labels and Jones' own account (1965), he collected in Soldier Canyon a day earlier (16 Sep 1903). Although Blake's assessment may be correct, there apparently is no way of knowing for certain; thus, I have cited the two duplicate sheets from Soldier Canyon as Neotype and Iso-neotype.

14. ERIGERON GALEOTTII (A. Gray ex Hemsley) Greene

Bellis mexicana A. Gray, Smithsonian Contr. Knowl. 5 (Plant. Wright., pt. 1): 93. 1852. TYPE: *MEXICO*. MEXICO: (no locality data), 26 Apr 1849, *J. Gregg 701* (HOLOTYPE: GH!; ISOTYPE: MO!). *Brachycome mexicana* (A. Gray) Reiche, Fl. Excurs., p. 184. 1926. *Astranthium mexicanum* (A. Gray) Larsen, Ann. Mo. Bot. Gard. 20:32. 1933. *Achaetogeron mexicanus* (A. Gray) De Jong, Publ. Mus. Michigan State Univ., Biol. Ser. 2:489. 1965.

non *Astranthium mexicanum* (A. Gray) Larsen var. *chihuahuense* Larsen (= *Erigeron strigulosus* Greene)

Achaetogeron galeottii A. Gray ex Hemsley, Biol. Centr. Amer. 2:119. 1881. TYPE: MEXICO. VERACRUZ: in woods on the peak of Orizaba, 2400–3300 m (8–11,000 ft), June–Oct 1840, *Galeotti 2166* (HOLOTYPE: K!, photo at US!). *Erigeron galeottii* (A. Gray ex Hemsley) Greene, Pittonia 2:168. 1891.

Gray apparently studied and tentatively annotated the Type collection of *Achaetogeron galeottii* during his studies at Kew in 1850-51. He had established the genus only a year earlier. However, it was not until 1881 that Hemsley (1881) published *Achaetogeron galeottii* with a Latin diagnosis in his account of Central American biology. In 1852, only shortly after his return to the United States, but apparently having forgotten the particulars about the nature of the specimens he had observed at Kew (or misinterpreting the variability within the species), Gray redescribed and named the same species on the basis of a different Type. The latter name, *Bellis mexicana*, was the one taken up for general usage. This commonly collected species was subsequently transferred with its well-known and geographically descriptive epithet to *Brachycome* to *Astranthium* to *Achaetogeron*, but upon reaching *Erigeron*, its nomenclatural niche is pre-empted by *E. mexicanus*

Sessé & Mociño. Thus, Greene's generic combination of Gray's epithet commemorating Galeotti must stand as the correct name.

15. ERIGERON GILENSIS Wooton and Standley

Erigeron gilensis Wooton and Standley, Contr. U.S. Natl. Herb. 16:184. 1913. TYPE: UNITED STATES. NEW MEXICO: Middle Fork of the Gila, 4 Aug 1900, *E. O. Wooton s.n.* (HOLOTYPE: US!).

Achaetogeron chihuahuensis Larsen ex Blake, J. Wash. Acad. Sci. 30:470. 1940. TYPE: MEXICO. CHIHUAHUA: vicinity of Madera, ca. 2250 m, 27 May-3 Jun 1908, *E. Palmer 301* (HOLOTYPE: MO!; ISOTYPES: CM!, DS!, NY!, US!).

16. ERIGERON OREOPHILUS Greenman

Erigeron oreophilus Greenman, Proc. Amer. Acad. Arts 41:257. 1905. TYPE: MEXICO. CHIHUAHUA: Norogachic, southern part of the state, 2550 m (8500 ft), Nov 1885, *E. Palmer 419* (HOLOTYPE: GH!; ISOTYPES: MEXU!, PH!, US 2 sheets!). *Erigeron delphinifolius* Willdenow ssp. *neomexicanus* (A. Gray) Cronquist var. *oreophilus* (Greenman) Cronquist, Brittonia 6:264. 1947.

Erigeron oreophilus Greenman forma *tenuilobus* Greenman, Proc. Amer. Acad. Arts 41:258. 1905. TYPE: MEXICO. SINALOA: Sierra de Choix, 15 Oct 1898, *E. A. Goldman 255* (HOLOTYPE: GH!; ISOTYPE: US!).

Erigeron oreophilus Greenman forma *latilobus* Greenman, Proc. Amer. Acad. 41:258. 1905. TYPE: MEXICO. CHIHUAHUA: base of Mt. Mohinora, 12.8 km from Guadalupe y Calvo, 2100–2250 m (7000-7500 ft), 23–31 Aug 1898, *E. W. Nelson 4861* (HOLOTYPE: GH!; ISOTYPE: US!).

Achaetogeron pringlei Larsen, J. Wash. Acad. Sci. 38:200. 1948. TYPE: MEXICO. CHIHUAHUA: cool slopes, Sierra Madre, 10 Oct 1888, *C. G. Pringle* 1625 (HOLOTYPE: MO!; ISOTYPE: UC!).

17. ERIGERON SEEMANNII (Schultz-Bipontinus in Seemann) Greene

Polyactidium seemannii Schultz-Bipontinus in Seemann, Bot. Voy. Herald, p. 301. 1856. TYPE: MEXICO. DURANGO: Sierra Madre, NW of Mexico, Nov-Jan 1849-1850, *Seemann 2026* (HOLOTYPE: K!, photo at MICH!; ISOTYPE: GH!). *Boltonia seemannii* (Schultz-Bipontinus in Seemann) Bentham and Hooker, Gen. Plant. 2:269. 1873. *Achaetogeron seemannii* (Schultz-Bipontinus in Seemann) A. Gray ex Hemsley, Biol. Centr. Amer. 2:120. 1881. *Erigeron seemannii* (Schultz-Bipontinus in Seemann) Greene, Pittonia 2:168. 1891.

18. ERIGERON STRIGULOSUS Greene

Achaetogeron palmeri A. Gray, Proc. Amer. Acad. Arts 11:386. 1886. TYPE: MEXICO. CHIHUAHUA: shady woods on the summit of the mountains above Batopilas, at about 2640 m (8800 ft), Aug-Nov 1885, *E. Palmer 362* (HOLOTYPE: GH!; ISOTYPES: MEXU!, NY 2 sheets!, PH, US 2 sheets!). *Erigeron strigulosus* Greene (nomen novum), Pittonia 2:169. 1891.

Erigeron sylvestris M. E. Jones, Contr. W. Bot. 12:44. 1908. TYPE: MEXICO. CHIHUAHUA: open woods, Soldier Canyon, Sierra Madre Mts., 16 Sep 1903, *M. E. Jones s.n.* (HOLOTYPE: POM 39229!; ISOTYPE: POM 39228!).

Astranthium mexicanum (A. Gray) Larsen var. *chihuahuense* Larsen, Ann. Mo. Bot. Gard. 20:32. 1933. TYPE: MEXICO. CHIHUAHUA: canyons of the Sierra Madre, 4 Oct 1888, *C. G. Pringle 2015* (HOLOTYPE: MO!; ISOTYPES: GH 2 sheets!, MEXU!, MSC!, MU!, NY 3 sheets!, PH, UC!, US 2 sheets!). *Achaetogeron perennis* De Jong, Publ. Mus. Michigan State Univ., Biol. Ser. 2:489. 1965.

19. ERIGERON WISLIZENI (A. Gray) Greene subsp. WISLIZENI

Achaetogeron wislizeni A. Gray, Mem. Amer. Acad. Arts, n.s. 4:72. 1849. TYPE: MEXICO. CHIHUAHUA: llanos, in the Sierra Madre W of Chihuahua, *Wislizenus s.n.* (HOLOTYPE: GH!). *Erigeron wislizeni* (A. Gray) Greene, Pittonia 2:168. 1891.

Astranthium mexicanum (A. Gray Larsen var. *chihuahuense* Larsen, Ann. Mo. Bot. MEXICO. CHIHUAHUA: cool, grassy slopes, rocky hills near Chihuahua, 19 Oct 1885, *C. G. Pringle 303* (incorrectly cited by Gray as *Pringle 103* (HOLOTYPE: GH!; ISOTYPES: CINC!, CM!, MEXU!, MICH!, NY 2 sheets!, PH, RSA!, US 2 sheets!). *Erigeron chihuahuanus* Greene (nomen novum), Pittonia 2:169. 1891.

The following may be used as an index to the disposition of names in *Achaetogeron*; following each *Achaetogeron* name is a number (in parenthesis) that refers to the currently accepted name in *Erigeron* in the text given above: *A. affinis* (13), *A. ascendens* (1), *A. chihuahuensis* (15), *A. corymbosus* (6), *A. filiformis* (2), *A. fisheri* (11), *A. forreri* (12), *A. howardi* (10), *A. galeottii* (14), *A. garciae* (3), *A. griseus* (3), *A. guatemalense* (4), *A. linearifolius* (1), *A. mexicanus* (14), *A. mimus* (5), *A. palmeri* (18), *A. perennis* (18), *A. pinnatifidus* (19), *A. polycephalus* (6), *A. pringlei* (16), *A. purpurascens* (9), *A. seemannii* (17), *A. sophiaefolius* (11), *A. subacaulis* (7), *A. versicolor* (8), *A. wislizeni* (19).

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DISTRIBUTIONAL RECORDS FOR *NYMPHAEA LOTUS* (NYMPHAEACEAE) IN THE WESTERN HEMISPHERE[1]

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ABSTRACT

Naturalized populations of *Nymphaea lotus* are reported for the first time in the Western Hemisphere. A recently discovered population in Florida is discussed and additional records of *N. lotus* in Louisiana, Guyana, Panama, Venezuela, Colombia, and Brazil are presented.

Nymphaea lotus (Linnaeus) Willdenow, a species of wide distribution in the Old World tropics, is here reported from several areas in the American tropics and subtropics. Although this species has been in cultivation in the Western Hemisphere for many years as an ornamental, these are the first naturalized populations to be reported. Conard (1905), in his monograph of the genus *Nymphaea*, placed *N. lotus* within subgenus *Lotos*, a grouping of four species native to the Old World tropics. According to Conard *N. lotus* is found throughout much of central and western Africa, Egypt, and Madagascar, and also in a few isolated populations in Hungary. However, my own herbarium and field studies of neotropical *Nymphaea* have revealed the presence of *N. lotus* in Florida, Louisiana, Guyana, Panama, Venezuela, Colombia, and Brazil as well.

My discovery of *Nymphaea lotus* in Florida occurred in March, 1980. At that time L. J. Davenport and I were in search of waterlilies of the night-flowering subgenus *Hydrocallis*, which Ward (1977) had recently reported from Florida. We had received information on populations of a *Hydrocallis* taxon in the Ft. Myers vicinity from Richard P. Wunderlin, who had just reported *N. ampla* (Salisbury) DC. from this area (Wunderlin & Les, 1980). In a moderately populated area north of Ft. Myers, we discovered *N. lotus* growing in a flowing roadside drainage canal. Numerous individual plants were observed at that time, ranging from vigorously growing and abundantly flowering adult plants to what appeared to be young seedlings.

In July of the same year we again returned to this locality to find a very dense stand of *Nymphaea lotus* extending a few hundred meters along the roadway. Stolon formation, a propagating mechanism attributed to this species by Conard (1905), may have been partially responsible for the expansion of

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this population, since stolons were observed on some individuals. Although flowers were abundant, a rather extensive search revealed only a few individuals with developing fruits, with most of these being only partially developed. Only one bee was observed in the population and no evidence was present of other insect pollinators such as beetles, which are known to pollinate other night-blooming *Nymphaea* species (Prance & Anderson, 1976; Schneider, 1979). A similar lack of insect visitation to flowers of *N. lotus* was noted by Mauve (1967) in populations of this species in South Africa, near the southern extremes of its range. Although no evidence of seed production was presented for the South African populations, the low seed set observed in the Florida population may be attributable to this lack of insect visitation.

Flowers of *Nymphaea lotus*, according to Conard (1905), are open from 7:30 p.m. to 11:00 a.m. In South Africa flowers of *N. lotus* were observed to be day-flowering (Mauve, 1967). In the Florida population flowers were just beginning to close at 11:00 a.m. EST in both March and July. Cultivated plants from this population open just after dark and remain open until 11:00 a.m. CST, as observed by Conard.

The artificial nature of the Ft. Myers drainage canal habitat strongly suggests a fairly recent introduction for *Nymphaea lotus* in Florida. Although a collection of sterile material from this population had been made in November, 1979 (Wunderlin, personal communication), no prior Florida records exist for this species. The collection had been mistakenly identified as *N. ampla*, a superficially similar species. Since the population appears to be expanding effectively via stolons and, to a lesser extent, by seed formation it seems quite possible that this species may become a permanent and perhaps more frequent constituent of the aquatic flora of Florida.

Recent work on *Nymphaea* in the southeastern United States has called my attention to specimens of *Nymphaea lotus* collected and determined by John Thieret in the mid 1960's from the parish of West Feliciana in southern Louisiana. The collections were made from a farm pond which, according to the owner's remarks as noted by Thieret, had contained the waterlilies since his purchase of the land 16 years previously—despite his efforts to eradicate them. Both white- and pink-petaled flowers were observed in this population, which doubtless originated from human introduction, indicating that a slightly different horticultural variety than the usual white-petaled form may have been involved in its initiation.

Additional work on herbarium specimens of neotropical *Nymphaea* has revealed the presence of *N. lotus* in other American countries. An interesting early collection in the Hooker Herbarium at K bears the information "Mr. Parker, Demarara." The specimen, which is clearly *N. lotus*, has no additional information, as is the case with other Parker collections of *Nymphaea* from Guyana. Biographical information indicates that C. S. Parker's Guyana collections date from 1824 (Urban, 1902) which would make this collec-

tion the earliest record of *N. lotus* in the American tropics. However, Caspary, a former authority on the taxonomy of tropical American *Nymphaea*, questioned the authenticity of this record with the Latin phrase "nu prope Demarara reperta im notist" in his annotation supplied about 1870. Caspary (1878) also omitted *N. lotus* from his subsequent treatment of South American *Nymphaea*. Conard's handwriting is absent from this specimen and he does not mention it in his monograph (Conard, 1905), although he viewed the material at K prior to this work. Interestingly, a 1945 collection from the interior of Guyana unmistakenly establishes the existence of *N. lotus* in that country and lends some credibility to the earlier Parker record.

Other collections of *Nymphaea lotus* from three Panama sites in the Canal Zone region which were made in 1940, 1967 and 1972 (same site), and 1973 have been observed. The 1940 collection was erroneously cited under *N. rudgeana* G. F. W. Meyer in the Flora of Panama treatment of the Nymphaeaceae (Duke, 1962). The more recent collections indicate that *N. lotus* still persists in Panama and may even be expanding its range there. Two more collections of *N. lotus* from the state of Zulia in western Venezuela (1972, 1976), one from central Colombia (1961), and another from the south Brazilian state of Santa Catarina (1956) indicate the presence of this species in several South American countries.

Other than the disputed Parker collection from Guyana, no records of *Nymphaea lotus* from the American tropics prior to 1940 exist. However, it is not impossible that this species was present but simply overlooked by collectors until that time. Herbarium records from cultivated plants of the American tropics indicate that *N. lotus* is frequently planted as an ornamental there. Thus it seems reasonable to attribute the origin of *N. lotus* in South and Central America to local introduction through cultivation, in most cases probably within the last century, with subsequent naturalization at the sites mentioned.

Plants of *Nymphaea lotus* are distinguishable from other neotropical *Nymphaea* by several characteristics. The mature leaves are regularly spinose-dentate, very strongly peltate (pelta 2–5 cm), and usually covered with short pubescence, which is sometimes very dense, on the undersurfaces and petioles. The peduncles are often pubescent as well and project the flowers up to 20 cm above the water surface. The normally white-petaled flowers are distinctive in having very prominently veined sepals, stamens with only minute connective appendages, and long (ca 10–15 mm) linear carpellary processes. Of other species with dentate leaves, *N. ampla* is glabrous, has stamens with prominent connective appendages, and has short conical carpellary processes. *Nymphaea rudgeana* is glabrous with very irregularly undulate or dentate leaves, has sepals lacking prominent venation, and has clavate carpellary processes.

Fig. 1-3. Flower (1), leaf margin (2), and habitat (3) of North Fort Myers, Florida population of *Nymphaea lotus*.

SPECIMENS EXAMINED: FLORIDA. Lee Co.: Along Alt US 41 in North Ft. Myers, 0.3 mi N of FLA 78, 2.5 mi NW of Caloosahatchee R. bridge, T43S, R24E, S½ Sec 35, 14 Nov 1979, *Les 157* (USF); 29 Mar 1980, *Wiersema 1442* (UNA); 25 Jul 1980, *Wiersema 1992* (UNA); 11 Oct 1980, *Beckner & Pagels 2444* (UNA, USF); 25 Oct 1980, *Wunderlin, Beckner, & Partridge 8847* (UNA, USF). LOUISIANA. West Feliciana Parish: 5 mi NE of St. Francisville, 16 Oct 1965, *Thieret 21434* (LAF); 27 Oct 1967, *Thieret 28289* (GA, LAF). GUYANA: Demarara, 1824, *Parker s.n.* (K); Mazaruni Station, Jul 1945, *Forest Department M413* (K). PANAMA. CANAL ZONE: Madden Lake, 3–20 Aug 1940, *Woodson & Schery 954* (MO, NY); Chagres R., ca 3 mi above Gamboa Bridge, 7 Feb 1973, *Kennedy, von Chong, & Steiner 2300* (MO). PANAMA PROV.: Lake at Las Cumbres, 7 Jun 1967, *Duke 11824(2)* (MO); 28 Nov 1972, *Correa, Mireya, & Dressler 1830* (MO). VENEZUELA. ZULIA: Districto Colon, carretera Coloncito-Machiques, una hora de Coloncito hacia Machiques, Sep 1972, *Carruyo 3* (MY); entre La Ceibita y el rio Tarro, carretera La Fria-Machiques, 10 Feb 1976, *Fernandez 2257* (MY). COLOMBIA. CUNDINAMARCA: Plan de Fusagasuga, 26 Sep 1961, *Olivares & Bernal 1* (COL). BRAZIL. SANTA CATARINA: Itaipava, Itajai, 1 May 1956, *Reitz & Klein 3238* (B, US).

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SOME NEW DISTRIBUTIONAL RECORDS FOR *LESQUERELLA LESCURII* (GRAY) WATSON (BRASSICACEAE), INCLUDING THE FIRST REPORT FOR KENTUCKY

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ABSTRACT

Lesquerella lescurii (Gray) Watson, a mustard of limited distribution and threatened status, has heretofore been viewed as endemic to the Central Basin of Tennessee. Recent collections show that the species is well established northwest of the Basin on the Highland Rim, apparently due to migration along the Cumberland River. Collections from Dickson County, Tennessee, are cited, making a total of nine known county occurrences from that state. The species is reported as new to Kentucky (Trigg County).

The genus *Lesquerella* Watson (Brassicaceae) has been studied extensively, including monographs by Payson (1922) and Rollins and Shaw (1973). Several species of eastern North America, especially those of the Middle Tennessee area, have been closely examined with respect to hybridization, distribution, and dispersal (Rollins 1952, 1957, Rollins and Solbrig 1973).

The species considered here, *L. lescurii* (Gray) Watson, has a limited distribution (Fig. 1) and has long been considered endemic to the Central (Nashville) Basin of Tennessee, a Section of the Interior Low Plateau Province of Fenneman (1938). This was noted by Rollins and Shaw (1973), but three of the eight counties they cited as comprising the total distribution are within the Highland Rim Section, *sensu* DeSelm (1959).

Because of this limited distribution, *L. lescurii* was considered a threatened species by Ayensu and DeFillips (1978) and the Committee for Tennessee Rare Plants (1978). However, it is locally abundant in the Central Basin and may sometimes be found in large stands on roadsides and in agricultural fields. Rollins (1955, 1957) noted that it thrives equally well on flood plains of rivers and on the thin soils of open, cedar glade-like areas of hill slopes, but it rarely, if ever, occurs on glades (Baskin *et al.* 1968).

Northwest of the Central Basin on the Highland Rim, early spring stands of several acres of *L. lescurii* may be found along the Cumberland River in bottomland meadows and fallow fields that were under tilth the previous year. Most of these sites are subject to occasional flooding. Also, it is not unusual to find small populations and scattered plants on open, upland sites

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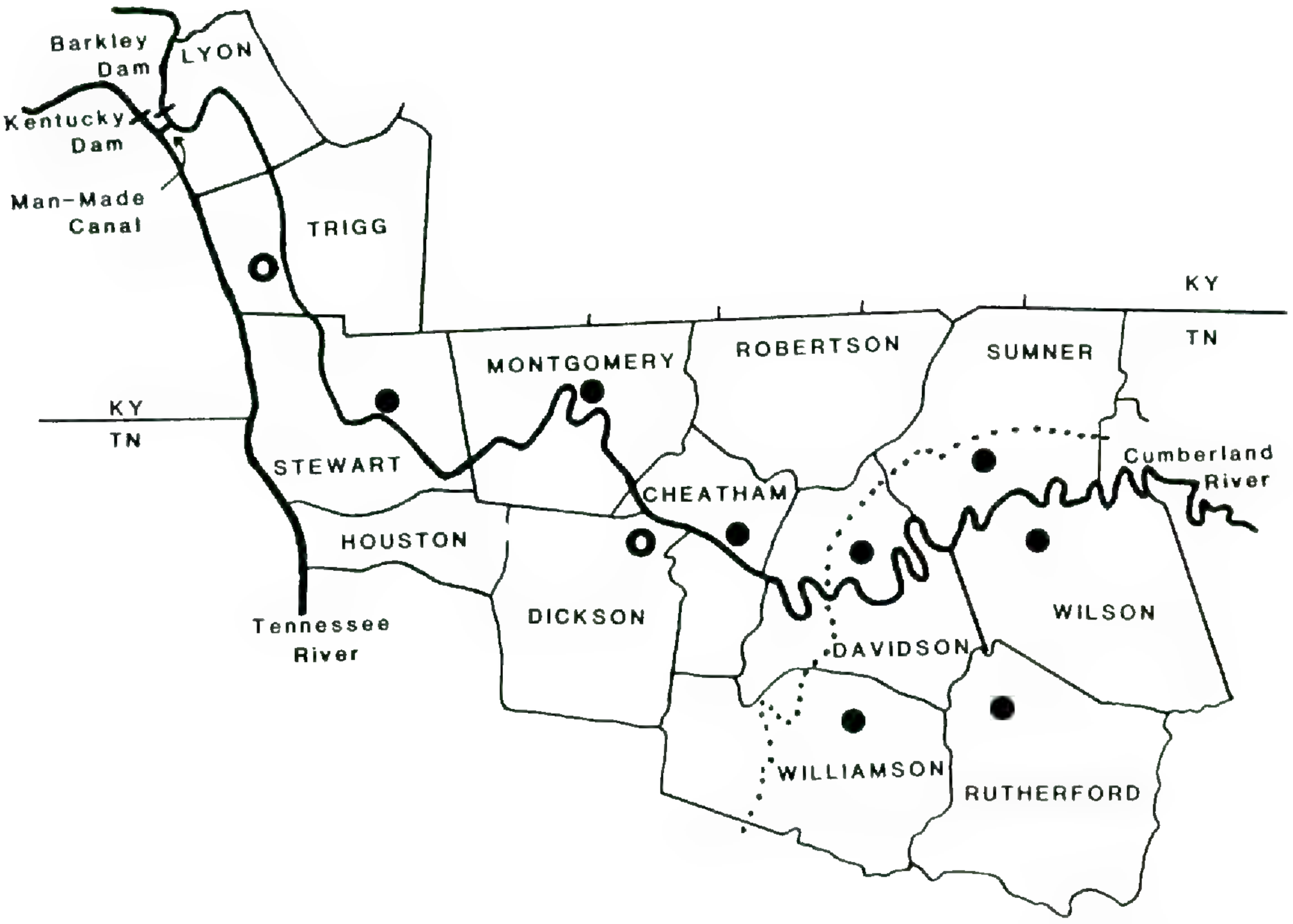

Fig. 1. The known county distribution of *Lesquerella lescurii* (Gray) Watson. Solid circles are reports of Rollins and Shaw (1973); open circles are first reports. The broken line is the approximate northwestern boundary of the Central Basin redrawn from DeSelm (1959).

several miles from the extensive bottomland stands. This is especially noticeable near the Basin in Cheatham County but less so westward in Montgomery County; upland sites have not been observed west or north of the latter County. These upland populations may be the result of dissemination by farm equipment since they are most often found on or near farm roads leading to bottomlands.

In 1980, several large populations were found on alluvium along the Cumberland River in Stewart County about 10 miles south of the Kentucky border, and it was suspected that the species might occur in that state as well. Searches in 1980 were unsuccessful, but in 1981 plants were found in an alluvial meadow in Trigg County. Only a few scattered individuals were observed, as opposed to the dense stands characteristic of similar habitats southeastward. Areas to the north, both below and above Barkley Dam (Fig. 1), were visited but no other plants were found.

Rollins (1973) noted that there is evidence that *L. lescurii* is actively expanding its range by natural means and through human activities. He discussed periodic flooding of the Cumberland River as an important factor in dispersal within the Central Basin. It appears that this river has provided a migratory route from the Basin into northern Tennessee and southern

Kentucky. It is not known whether or not impoundment due to Barkley Dam, constructed in 1966, has been significant in this migration (occasional flooding of bottomlands not permanently inundated still occurs), but the lack of previous reports from Kentucky may indicate recent movement there.

In summary, the collections cited below increase from eight to nine the number of Tennessee countries known to harbor the species and add it to the known Kentucky flora. It is not endemic to the Central Basin of Tennessee but has spread, via the Cumberland River, to the western Highland Rim of Tennessee and Kentucky. The extent and number of populations are much reduced downstream from Montgomery County and are limited to alluvium. Further northward migration may follow, but impoundment has left few suitable habitats between the Tennessee-Kentucky border and Barkley Dam. The man-made canal connecting the Cumberland and Tennessee rivers 40 river miles north of the presently-reported northernmost site could possibly allow for seed dispersal to that drainage system.

Specimen citations: TENNESSEE. Dickson Co.: floodplain of Cumberland River between mouth of Harpeth River and Johnson Creek, 3 Apr 1981, *Chester and Scott 8117* (APSU). Stewart County: Cumberland River bottomlands near mouth of Bear Creek; 18 Apr 1980, *Chester, Carpenter, and Stack, 4354*, ! Reed C. Rollins (APSU, GH). KENTUCKY. Trigg County: west shore of Cumberland River across from Linton; *Chester, 81-3* (APSU).

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SOME NOTES ON *DICERANDRA* (LAMIACEAE)

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Nineteen years ago Dr. Lloyd Shinners (1962) did a synopsis of *Dicerandra* in which he described a new, shrubby species, *D. frutescens*, from peninsular Florida. In 1963 still another new woody Floridean species, *D. immaculata* was added by Olga Lakela. Thus, what for years was thought to be a genus of three annuals turned out to be a much more complex group.

My practical interest in *Dicerandra* was stimulated by having to write descriptions, together with forest management implications, for the three species that are federally listed as threatened or endangered. As a result of this, involving some field work on the plants going back to 1975, I came to have enough information to add to Dr. Shinners' synopsis and had written up what appeared to be yet another new *Dicerandra* from Florida. I have, however, been informed that this same taxon has been published in advance of my own, under the name *D. cornutissima* by Ms. Robin Huck (1981). However, it was gratifying to know that my opinion was arrived at independently by a full-time student of the genus.

In that a full study has been planned for *Dicerandra* by Ms. Huck, my own necessarily is confined to remarks on morphology, distribution and habitat.

Most of the funds for field work have been provided through cooperative agreements # 42-4750, # 42-272, and # 42-283 between the Forest Service and Vanderbilt University and this aid is gratefully acknowledged, as is that from curators and staffs of FLAS, FSU, GA, NCU and US, who provided either loans or facilities.

MORPHOLOGY AND ECOLOGY

Dicerandra has a rather uniform morphology very similar to other mints with hairy-annulate calyces such as *Calamintha, Conradina, Micromeria.* It is distinguishable mostly by the cornute anthers. In the annuals a pathogen stimulates a fusiform gall in the root; however the plants that develop such galls are larger, more vigorous than are those that do not. All annuals tend to show a small "crook" of stem just above the taproot but are otherwise erect. The shrubs, on the other hand, produce dimorphic shoots, floriferous ones which are erect or ascending and which die back to base at the end of a season, and non-floriferous ones which are more densely leafy and which as a rule are lower, spreading, decumbent or sprawling, and last through the

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winter. From the latter arises the floriferous and sterile shoots for the next season. All species produce axillary leafy shoots at most nodes; these, suppressed in most cases, give most nodes the appearancce of having leafy fascicles.

The fundamental inflorescence is a symmetrical, simple or compound, dichasium, ascending and convex inside (Fig. 1). The most complex cyme (Fig. 1-a) is one with seven flowers (more buds may form but these rarely reach flowering size), and is sessile or has a basal peduncle which terminates in a pair of bracts and three axes, the central one bractless, terminating in a single flower, the laterals each forming bibracteate simple dichasia. From this seemingly more primitive type there may be reduction to six flowers or five (Fig. 1-b), where the lateral dichasia do not develop, or at the end of the line (Fig. 1-e) to a single, bibracteate flower. All species exhibit some range in flower number but *D. linearifolia, D. densiflora, D. odoratissima* and *D. immaculata* tend to vary the most and *D. frutescens* and *D. cornutissima* definitely trend toward few-flowered cymes.

While the basic plan of the flower in this genus is fairly uniform as to character of the whole inflorescence, calyx, corolla lobing, character of stamen, gynoecium and fruit, there are remarkable differences in general pigmentation, insect guide mottlings, indument. On the basis of corolla design and stamen orientation *D. odoratissima* stands strongly apart from all others and probably should be considered as a distinct, monotypic, section (for detail, see description!) While all species have cornute anthers it is of interest to note that one, *D. densiflora* has very reduced anther horns and at the same time shares more characteristics with the wide-ranging *D. linearifolia* than it does with any other. Morphological relationships within the genus will be taken up briefly later.

All *Dicerandra* are confined to the Coastal Plain with only one (*D. linearifolia*) approaching the Fall Line Hills. Their habitat is rather uniformly droughty, mostly the yellow or white sands of sandhills or disturbed open areas whose soil is high in sand. The commonest forest types in which these mints abound are longleaf pine-turkey oak, sand pine-evergreen scrub oak, or live oak-pine. Common shrub associates are in genera *Serenoa, Yucca, Quercus, Polygonella, Ceratiola, Persea, Rubus, Chrysobalanus, Prunus, Ilex, Ximinea, Opuntia, Lyonia, Vaccinium, Bumelia, Chionanthus, Calamintha, Conradina, Chrysoma, Garberia.* Associated herbs are mostly those occupying lower seral stages of sandhills or sandy soil succession, characterized by influences of fire and wind which reduce the woody competition and maintain sandy openings. All *Dicerandra* appear readily to invade adjacent mechanically disturbed sites or those in which fire management of longleaf pine is practised. The remarkable fact is that, while they do display weedy tendencies, they show little signs of spreading, nor have I yet seen examples of mixed populations.

The genus is mostly fall-flowering, entirely insect-pollinated. Various

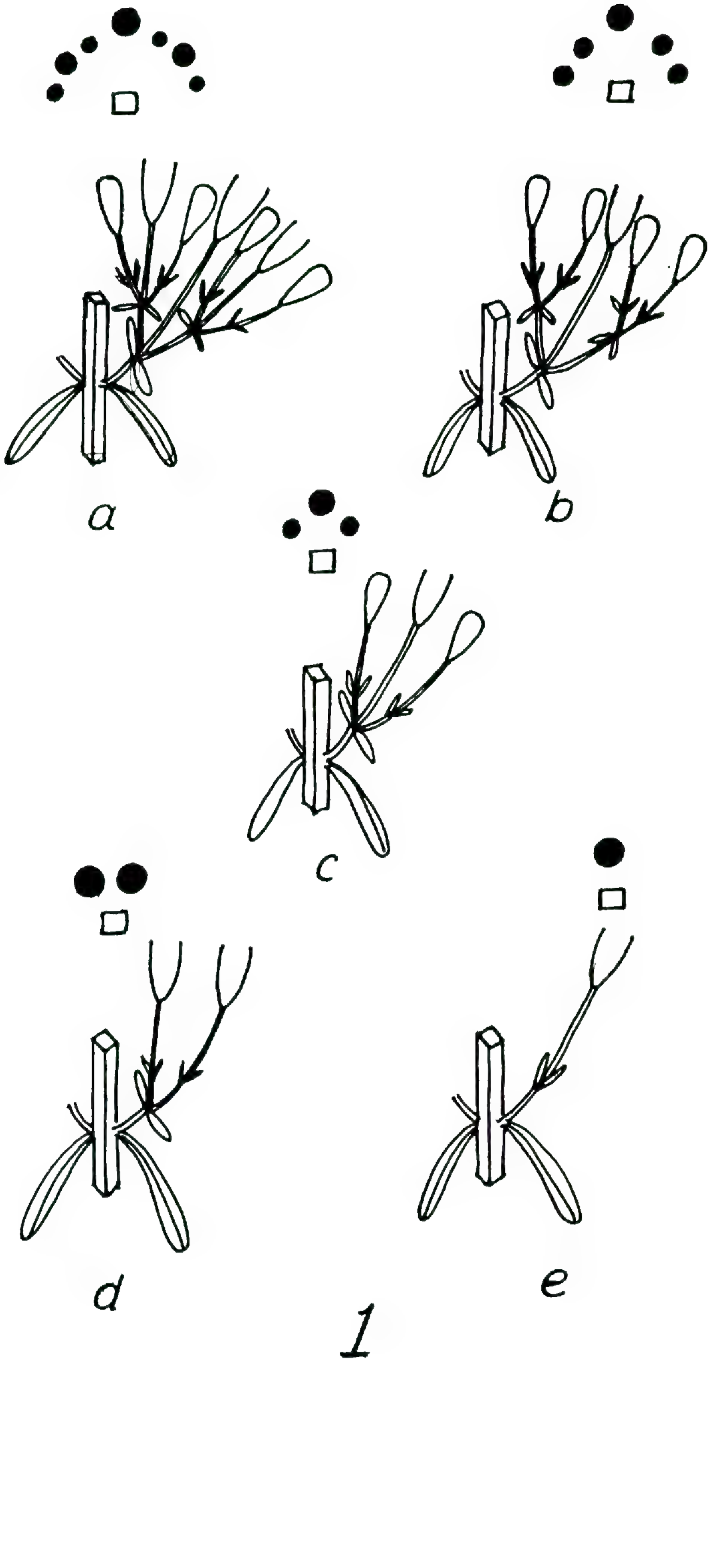


Fig. 1. Inflorescence types of *Diceramdra.*

long-tongued flies, particularly hoverflies, moths (especially small sphinx moths, clearwings) and a wide spread of bees such as megachilids, andrenids, honeybees and bumblebees visit the flowers, the larger bees often parking on the lower corolla lip, depressing the flower as they thrust their heads into the corolla throat. Pollen exchange between plants appears to be heavy. There are as yet no reports of hybrids between species, perhaps not surprising in that, while sometimes two species may occupy sandy habitat in the same county (i.e. *D. linearifolia* and *D. odoratissima* in some Georgia counties, *D. densiflora* and *D. linearifolia* in some Florida counties) no two species appear to occupy the same site. Results of test crosses made in a full study should be of real interest.

Some speculation as to species relationships based on morphology and geology history seems appropriate here.

Of the six species, three (*D. immaculata, D. cornutissima, D. frutescens*) are very narowly endemic shrubs confined to peninsular Florida. The other three, as stated earlier, are annuals (*D. linearifolia, D. densiflora, D. odortissima*) with *D. linearifolia* the most expressive morphologically and covering the next-largest area, and *D. densiflora* with the smallest geographic area of the annuals and with the greatest character overlap with extremes of *D. linearifolia.*

If one studies carefully the cymes of all the species two observations become significant. First, there does appear to be a reduction series as to number of flowers developed in a cyme (Fig. 1 and discussion). Second, there are buds developed in cymes of all species that do not ever reach flowering size. This sort of evidence weights toward the idea that the *Dicerandra* inflorescence arose from an ancestor that had axillary cymes with more flowers than are now developed in the genus, and that this sort of reduction has culminated in the largely single-flowered cyme of *D. frutescens.* Such trends are present in many other genera of Lamiaceae.

Maps of the species (Fig. 8) show that *D. linearifolia* and *D. odoratissima* in addition to being found on younger Coastal Plain terraces and covering the largest geographic areas, are found also on land with an older history. The story best borne out by a combination of morphology and geography is that *D. linearifolia* and *D. odoratissima* are the oldest species, derived from a common ancestral complex. It is of interest to note that these two have substantial range overlap, yet do not seem to produce intermediates. These sorts of data support the idea that, while the opportunity for genetic traffic between the two is greater than it is for the other species, it does not happen, and the two seem to have been isolated reproductively for some time. *Dicerandra odoratissima* in fact has diverged enough to constitute a distinct section of the genus or even enough to have become a genus (consistent with some generic concepts in Lamiaceae). *Dicerandra linearifolia,* being the most diverse morphologically as well as being the most wide-ranging species, is closest to the type from which the remaining four species

could have arisen. Such appears to have been the case in *D. densiflora.*

Field work in the Suwannee River system of Florida reveals that populations of *D. linearifolia* there are consistently broader-leaved and pinker flowered than is the case with populations north and west of the system. However, southward along the Suwannee there is a break, and what may appear from a distance to be more stands of broadish-leaved, lavender-rose-flowered *D. linearifolia* on closer inspection have the white, nearly hornless anther and the sessile cymes of *D. densiflora.* There is no doubt about the affinities of these two taxa.

The suffruticose peninsular Floridean *Dicerandra* must also have a comparatively recent derivation, with *D. immaculata* having arisen from eastern peninsular *D. linearifolia*, which is mostly pink-flowered, and *D. cornutissima* and *D. frutescens* isolated from a pale-flowered "*linearifolia*" type of connecting morphology that once was more continuous in the Central Highlands. If trends of inflorescence reduction have any significance along a time scale, it would seem that *D. cornutissima* and *D. frutescens* arose comparatively recently, and along the highlands axis.

NOMENCLATURAL HISTORY

The name *Dicerandra* is based on a specimen sent to Hooker by Stephen Elliott of a plant he had described (Sk. Bot. S.C. & G. 2: 1822) as *Ceranthera linearifolia.* Unfortunately A. M. F. J. Palisot-de-Beauvois (Flore d'Oware et de Benin en Afrique, Vol. II, p. 10, 1807) had already applied *Ceranthera* to a violaceous plant, while C. S. Rafinesque (Am. Monthly Mag. & Crit. Rev. 1818) had applied it to a genus of Solanaceae. Thus, *Ceranthera* being preoccupied, Bentham applied to the Elliott specimen a new name, *Dicerandra* (Bot. Reg. 15. 1830). As Shinners stated (1962) "Elliott's only species, *C. linearifolia*, is automatically the type." The name Bentham chose is apt reference to the cornute anther. The holotype has been determined by Dr. Stuckey (see discussion under *D. linearifolia*).

TAXONOMIC TREATMENT

DICERANDRA Bentham, Bot. Reg. 15: 5. 1300. 1830; Benth. in DC. Prodr. 12: 242. 1848.

Ceranthera sensu Ell. (1822), not Beauv. (1807), not Raf. (1818).

Shrubs or annual herbs, mostly from a taproot or branched taproot, the foliage and flowers glandular-atomiferous and strong smelling. Stems equally or unequally quadrate, smooth or puberulent, mostly erect, simple or profusely and oppositely branched. Leaves decussate, entire or nearly so, sessile or short-petiolate, narrow, from nearly filiform to linear, oblong-linear, linear-elliptic, lanceolate or oblanceolate. Flowers bisexual, bilabiate, in sessile or pedunculate, bracteate, 1–7-flowered axillary cymes, the whole inflorescence narrow, elongate, dense or interrupted regularly, indeterminate

or with central cymes opening first. Calyx tubular-funnelform, with 13 strong ribs, 2 strongest, lateral and distally alate on the somewhat flattened upper side, externally dotted with clear sessile glands over the thin intervals, internally with an annulus of stiff, long, pale, erect hairs, also often strigose on the inner surface of the lower lip; upper calyx lip curved upward, ciliate, broadly rounded, but with 2-3 low and convergent teeth, slightly shorter than the lower lip, this triangular, projecting forward, cleft halfway or more to form 2 teeth, these narrowly triangular, sharp, divided by a sharp, narrow sinus, strigo-ciliate. Corolla bilabiate, the tube erect in the calyx, narrow, in all but one species internally villous throughout, at varying levels from just beyond calyx orifice to well beyond it either (a.) expanding to a short, wide funnelform throat and here bent outward with the floor of the throat base developing a shallowly bilobed palate, or (b.) gradually dilated into an excurved throat and limb; upper corolla lip slightly shorter than the lower, curved upward or forward, usually oblong or broadly ovate, apically either narrowly rounded or broadly rounded-emarginate, internally smooth or with a subapical villous style clamp; lower corolla lip directed downward, broadly obovate, deeply 3-lobed, the central lobe emarginate, the lateral lobes variously spreading or declinate; corolla color white, yellowish-white, lavender or rose with all but one species producing on the limb purple lines or maculations. Stamens 4, didynamous, the filaments smooth, terete, linear, arising in the lower throat, the shorter pair departing laterally to and just below the upper lip, the longer pair departing lateral to the lower lip, all either bending forward at the throat geniculation, thus at anthesis projecting forward and exserted, or arching upward under a hooded upper corolla lip and included; anther sacs 2, divergent, ovoid, joined by a broad and somewhat flattened, dorsally concave, connective, with the narrowed locular ends convergent and each chamber producing toward the broad end or medially a prominent, curved spur or at least a papillate dome, the sporangial dehiscence an oblique slit external to the spur. Ovary deeply 4-lobed, the lobes set like molars into a fleshy, unilaterally lobed, gynobase; style slender, lineal, terete, pilose or nearly smooth, erect in the corolla tube base, then ascending to the roof of the corolla, thence to the upper corolla lip, there either jutting forward or downward, prominently exserted or hugging the roof of the upper lip with only the apex protruding; stigmas 2, narrowly triangular-linear, sharp, mostly equal, at anthesis excurvate, external surface rounded, internal (receptive) surface either flat or concave. Nutlets 4, rather uniform, mostly broadly ovoid, ca 1 mm long, tumid, with attachment scar oblique at base.

A small genus confined to the southeastern U.S.A. Type species: *Dicerandra linearifolia* (Ell.) Benth.

KEY TO DICERANDRA

1. Plants herbaceous, annual, taprooted; stem faces subequal.

2. Upper corolla lip bent upward, flattish, not hooded; stamens and style tip conspicuously exserted; corolla geniculate at junction of tube and throat and with distinct palate; lower calyx lip not over 2.5 mm long; odor strongly minty.
   3. Primary cymal peduncle well over 1 mm long; anthers pink or white with horns at least 1 mm long; corolla lavender-rose to white ..... 1. *D. linearifolia*
   3. Primary cymal peduncle obsolete or less than 1 mm long, thus cymes sessile or subsessile; anther sacs white, the horns reduced to papillate domes ..... 2. *D. densiflora*
2. Upper corolla lip arching forward, folded, hooded; stamens and stylar tip barely projecting; corolla not geniculate, without a palate; lower calyx lip seldom less than 3.0 mm long; plants with strong but un-minty scent ..... 3. *D. odoratissima*

1. Plants shrubby; one set of stem faces narrower, more deeply concave than the other.
   4. Flowering inflorescence barely interrupted; leaves mostly 2–5 mm wide; calyx deeply purple or rose-tinted; pinkish around the thin orifice; corolla limb and throat lavender-rose, spotless; southeastern peninsular Florida ..... 4. *D. immaculata.*
   4. Flowering inflorescence regularly interrupted, the internodes conspicuously longer than the inflorescences; leaves rarely 3 mm wide, mostly narrower; calyx tube mostly green or tinged with purple distally, white around the orifice; corolla strongly geniculate, the limb and throat white or yellowish-white, always with purple lines and maculations; central peninsular Florida.
      5. Cymes prevalently 1–2-flowered; leaf blades mostly oblong-linear, 2–3 mm wide; corollas 1.9–2.0 cm long ..... 5. *D. frutescens*
      5. Cymes prevalently 3-flowered; leaf blades narrowly linear to nearly filiform, rarely over 1.5 mm wide; corollas 1.2–1.3 cm long ..... 6. *D. cornutissima.*

1. DICERANDRA LINEARIFOLIA (Ell.) Benth., Bot. Reg. 15, t. 1300. 1830.

Ceranthera linearifolia Ell., Sk. Bot. S. C. & Ga. 2: 94. 1822.

Taprooted annual to 6 dm, mostly lower, with stem faces scabro-puberulent, particularly along the acute to rounded angles. Leaves narrowly elliptic through linear-oblanceolate and linear-lanceolate to narrowly linear, spreading to nearly erect, (1-) 2–4 (-5) cm long, acute to narrowly rounded, tipped by a pale blunt callus, completely smooth to scabridulous toward and on margins above. Cymes in bloom usually shorter than the subtended internode, 1–5 (mostly 3)-flowered, on peduncles 2–5 (-10) mm long. Calyx 6.5–7.0 mm long, with upper lip 1.5–1.7 mm long, lower lip 2.0 mm long, with 2 narowly triangular-subulate teeth having a sinus ca 1 mm deep; outer surface pale green to maroon, the orificial area whitish to pink, Corolla 1.5–1.7 cm long, tube ca 5 mm long, villous internally, geniculate, the throat ca 5 mm long, villous at base inside and with a palate, the upper lip ca 5 mm long, broadly ovate, upswept and emarginate; lower lip ca 6–7 mm long, broadly obovate, the lateral lobes oblong to broadly spatulate, ca 5 mm long, spreading, the central lobe obovate, emarginate; surface white, yellowish-white, or lavender-rose, with throat and limb dotted and lined concentrically with purple maculation. Filaments 10–15 mm long, anther horns 0.7–1.0 mm long, smooth. Figs. 2 and 2a.

Fig. 2. *Dicerandra linearifolia.* a. habit sketch; b. two views of node and cymule; c. mid-cauline leaf; d. side view of floret; e. front view of corolla; f. nutlet. From *Kral 64458.*

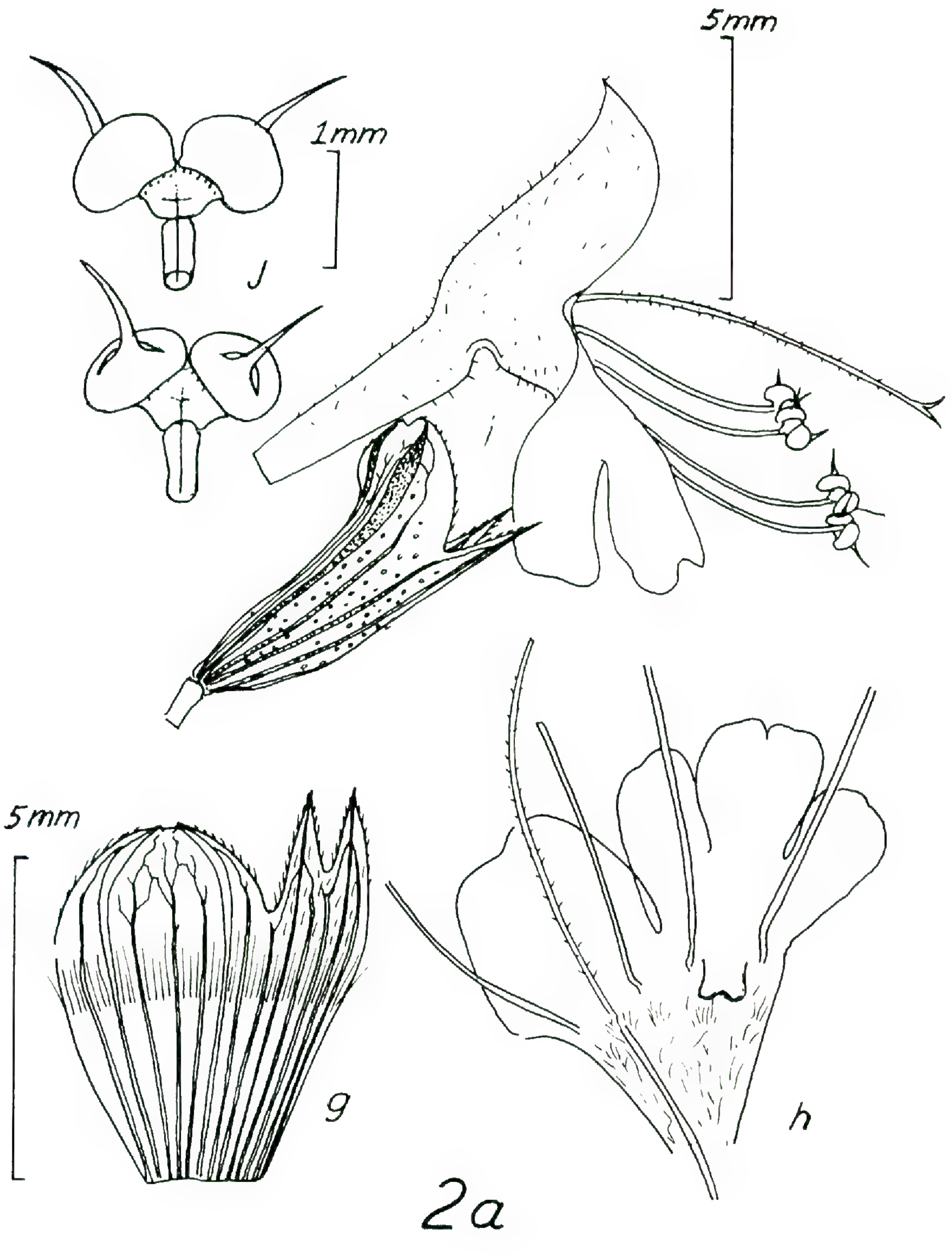


Fig. 2a. *Dicerandra linearifolia.* g. spread calyx; h. spread corolla; i. side view of upper corolla tube, corolla throat and limb; j. anterior (top) view and posterior (bottom) view of anther. From *Kral 61354.*

Sand ridges and sandy barrens, Coastal Plain, eastern Georgia south to northern Florida, west into southern Alabama and far western Florida. Fig. 8a.

TYPE: Shinners (l.c.) reported that Weatherby (1942) could find no specimens of *D. linearifolia* in the Elliott Herbarium. However Stuckey (1979) reported an Elliott specimen of *D. linearifolia* in the Schweinitz Herbarium at PH, presumably sent by Elliott to Schweinitz. Stuckey's photograph is unmistakable and his annotation of the specimen as the type for both species and genus should be accepted. Elliott (l.c.) stated that it "grows abundantly in the high pine barren ridges between Flint and Chatahouchie Rivers", and it grows there today. The remark is fortunate evidence in that no other *Dicerandra* are in that part of Georgia.

2. DICERANDRA DENSIFLORA Benth. in DC., Prodr. 12: 243. 1848.

Ceranthera densiflora (Benth.) Gray, Syn. Fl. N. A. 2, pt. 1: 365. 1878.

Similar in habit and in most ways to *D. linearifolia* but leaves mostly broader, narrowly lanceolate, oblanceolate, or oblong, 2–5 cm long, 3–8 mm wide. Inflorescence internodes more contracted, the cymes sessile or nearly so, the whole inflorescences more dense, the pedicels shorter (mostly 2–3 mm long), the larger inflorescences often 7-florous. Corollas mostly 1.0–1.2 cm long, nearly all pink, but with maculation as in *D. linearifolia.* Anthers whitish, lacking horns, these having been reduced to low-triangular or dome-shaped, papillose-tuberculate, pale processes. Figs. 3, 3a.

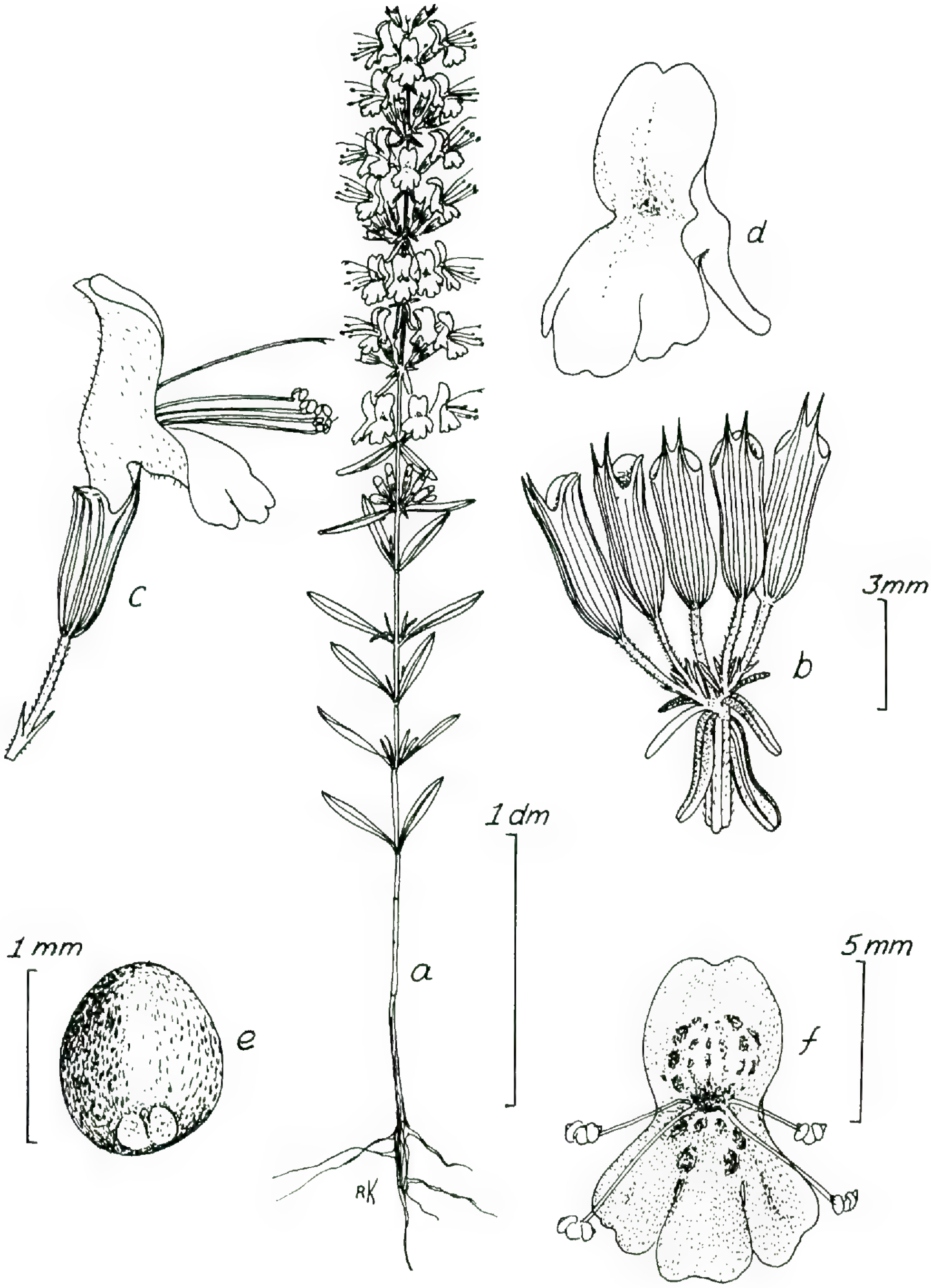
Sand ridges and sandy barrens in oak-pine scrub, northern Florida, mostly along the Suwannee but also northeastern peninsular Florida. Flowering mostly from September into November. Fig. 8b.

TYPE: "In Florida orientali" (h. Torr. at NY). Type not seen by writer, but original description unmistakable in that no other *Dicerandra* has reduced anther horns.

Small (1933) indicated that the species is in Georgia but I have not found it there. There are, along the Suwannee in Hamilton County Florida and adjacent Lowndes County Georgia many large populations of *D. linearifolia* which are consistently broad-leaved, mostly with lavender-rose corollas, which cursorially could be mistaken for *D. densiflora.* However, these populations have strong cymal peduncles and well developed anther horns, the anther sacs consistently purplish. As stated, southward along the Suwannee such populations abruptly stop, to be replaced by large populations of *D. densiflora.*

Sandy clearings, both natural and artificial, in the high live oak-slash pine-saw palmetto hammock or in the longleaf pine-scrub oak-live oak along the Suwannee from Branford to Oldtown and west within the drainage are good habitat for the species, which by mid-October lights up the landscape with "Liatris-like" spires of lavender-rose.

3. DICERANDRA ODORATISSIMA Harper, Bull. Torr. Bot. Club 28: 479. 1901.



3

Fig. 3. *Dicerandra densiflora.* a. habit sketch; b. cymule; c. side view of flower; d. oblique view of corolla; e. nutlet; f. front view of flower. From *Kral 64511.*

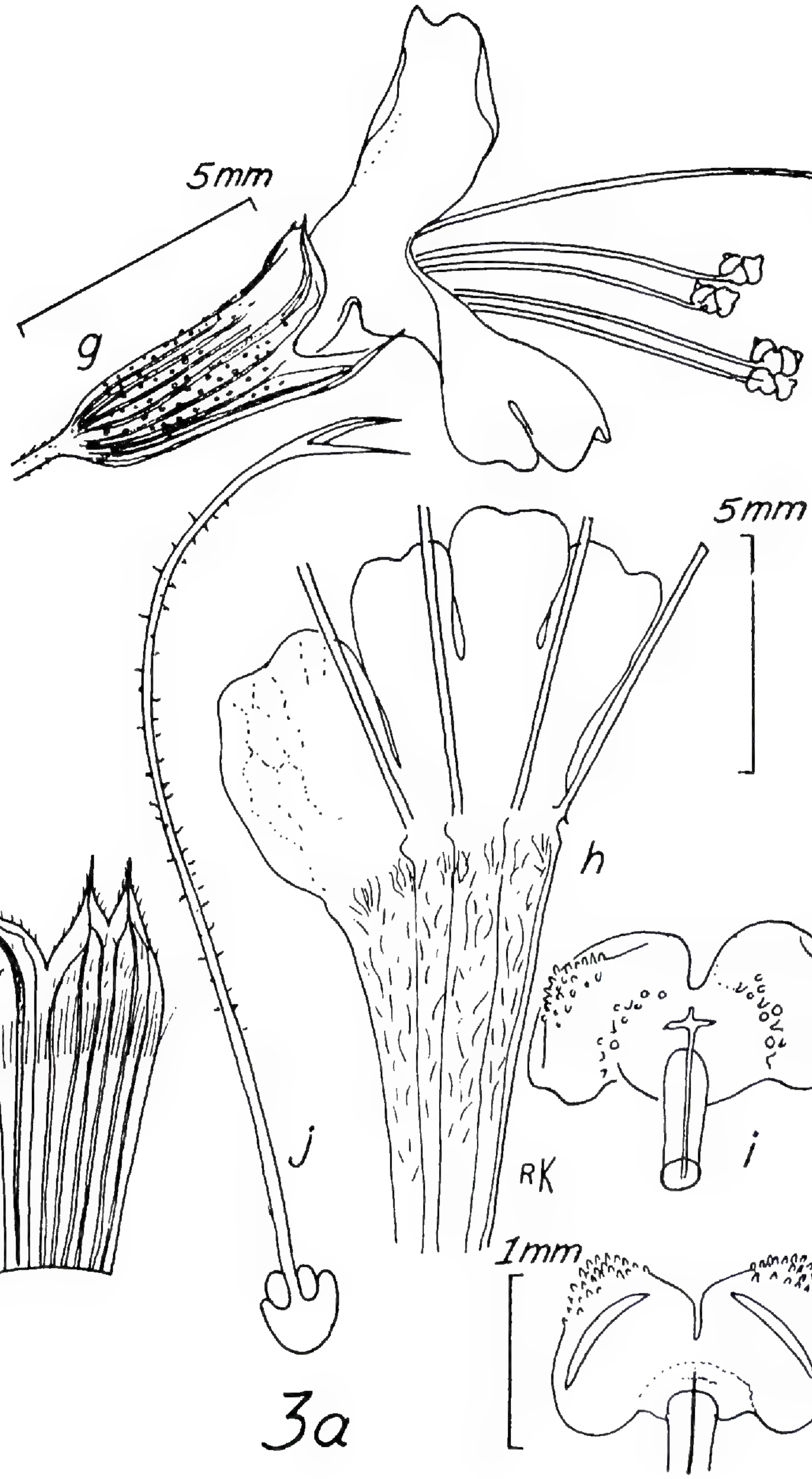


Fig. 3a. *Dicerandra densiflora.* g. spread calyx (below) and side view of calyx with corolla; h. spread corolla; i. anther, two views; j. gynoecium. From *Kral 64511.*

Taprooted annual with a pungent, un-mintlike odor. Stems rigidly erect or ascending, simple to profusely branched, mostly 1–4 dm high, the faces subequal, rounded-angled, incurved-gray-puberulent. Leaves narrowly linear to narrowly elliptic, lanceolate or oblanceolate, 2–4 cm long, 1–2 (-4) mm wide, narrowly rounded or obtuse-angled apically, frequently emarginate, in inflorescence and on upper stem often reflexed, otherwise spreading or ascending, the upper surface green to maroon, usually scabrid along the revolute margin, the lower surface paler, smooth save along the midrib where scabridulous or puberulent. Inflorescence dense, the numerous cymes sessile or nearly so, mostly overlapping at anthesis, the flowers 3–7, the calyces at anthesis erect or strongly ascending, the longest (9–10 mm) in the genus, apically very strongly whitened or roseate, the tube 5.0–5.5 mm to lip sinus, the upper lip 2.5–3.0 mm long, the lower lip 3.5–4.0 mm long, the sinus fully 3 mm deep, the teeth narrowly triangular-subulate. Corolla erect or ascending, 1.5–1.7 mm long, tube gradually dilating into throat, this and the limb excurvate but not geniculate, a palate lacking, the upper lip ca 4 mm long, hooded, ovate, acute or narrowly rounded, the lower lip slightly longer, broadly obovate, directed downward, with central lobe emarginate, the laterals shorter, spreading laterally, oblique; external surface from near white to deep lavender-rose, rather coarsely pilose or hirsute toward apex and marginally, stipitate-glandular-puberulent and villosulous toward base, medially and distally marked with dots and lines of purple, within villous and capitate-hairy toward tube base, otherwise smooth or papillose save for a tuft of arachnoid pilosity in the fold of the upper lip distally and another villous patch below it on the lower lip, the upper tuft appearing to serve as a style clamp. Stamens largely concealed by upper corolla lip, the short pair of filaments ca 3.0–3.5 mm long, long pair ca 5 mm long, all pinkish; anther sacs usually purplish, the horns ca 0.5 mm long, directed downward. Style bristly-hairy at least toward apex. Fig. 4, 4a.

Sandhills and sandy clearings, sometimes in light shade, mostly uplands along major streams, Coastal Plain, Jasper County South Carolina southward to southern central and southeastern Georgia; flowering from August to frost. Fig. 8c.

TYPE: GEORGIA. Coffee Co.: dry sand-hills near Seventeen Mile Creek, 24 Sep 1900, *R. M. Harper 695* (HOLOTYPE: NY; ISOTYPE: MO!).

Dr. Harper (op. cit.) commented succinctly and accurately on the distinctness of this species, noting that to include it in *Dicerandra* meant considerable amplification of the generic description. Its corollas are not geniculate, lack a palate completely; orientation of the anthers is very different and the subapical tuft of arachnoid hairs internally on the corolla roof is likewise distinctive. Chemically the species must be as apart as are the flowers, in that the odor of the plants is disagreeably powerful, quite unlike the consistently strong minty smell of all of the other species.

Fig. 4. *Dicerandra odoratissima*. a. habit sketch; b. cymule; c. nutlet d. oblique view of small section of stem. From *Kral 59143*.

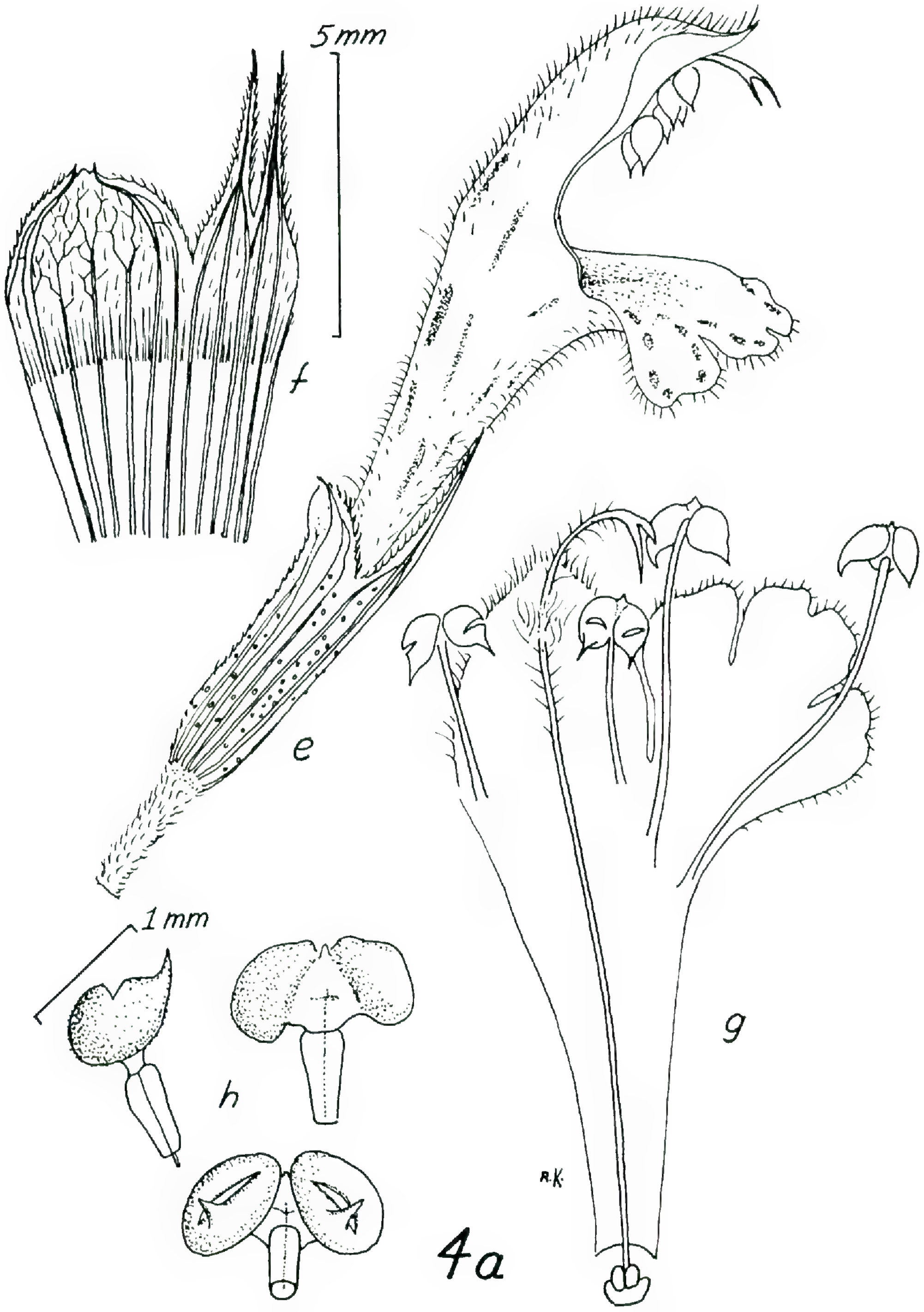


Fig. 4a. *Dicerandra odoratissima*. e. side view of flower; f. spread calyx; g. spread corolla; h. three views of author. From *Kral 59143*.

4. DICERANDRA IMMACULATA Lakela, Sida 1(3): 184–185. 1963.

Bushy or lax (sun vs. shade) shrub to 5 dm high, forming small mats or domes of ascending to spreading or sprawling branches, the several primary branches arising from a stout, deep, woody-branched taproot. Innovations numerous, arising from spreading or sprawling older growth, decumbent based, otherwise erect, smooth or nearly so, green to purplish, unequally quadrate with faces subtending leaves broader and low-convex alternating with narrower, strongly concave faces, the sharp, incurved angles margined by a narrow costa or wing. Main leaves spreading or ascending, in inflorescence sometimes reflexed, all subsessile, linear, oblong-linear, linear-elliptic, linear-lanceolate or linear-oblanceolate, 2–3 cm long, 2–4 mm wide, smooth, flattened, apically narrowly rounded, often slightly emarginate, entire or in larger leaves minutely serrulate apically. Inflorescence mostly 1.5–2.5 dm long, with flowering cymes overlapping, (1-) 3 (-5) flowered, the primary peduncle 1.0–1.5 mm long, the secondary branches as long, the pedicels 1–3 mm long, nearly erect. Calyx 7–8 mm long, smooth, the reflexed tipped upper lip 2 mm long, lower lip ca 2.5 mm long, sinus between teeth ca 1 mm deep, the body usually purplish, toward orifice becoming white or roseate. Corolla 1.9–2.0 cm long, tube ca 6 mm long, internally villous here and at throat base, with a strong palate just above geniculation; upper corolla lip broadly ovate to obovate, ca 7 mm long, apically upswept, broadly rounded-emarginate, lower lip broadly obovate, trilobate, 9–10 mm long, downswept, with lateral lobes spreading, oblong, broadly rounded or oblique-truncate, and medial lobe emarginate; external surface of throat and limb bright lavender-rose, immaculate, puberulent. Posterior filaments ca 12 mm long, anterior pair ca 12 mm long, the much exserted anthers with horns 1.5–2.0 mm long, minutely papillate-tuberculate. Style projecting, becoming downcurved, hirtellous distally, the two subequal stigmas presented beyond the anthers. Figs. 5, 5a.

White and yellow sands of old dunes, duneswales, southeastern peninsular Florida; flowering from late September into November. Fig. 8d.

TYPE: FLORIDA. Indian River Co.: on disturbed sandscrub. West of U.S. 1, near South boundary of Indian River County, 30 Sep 1962, *O. Lakela 25440* (HOLOTYPE: USF; ISOTYPE: SMU!). Topotypes collected 2 Oct 1976 (*Kral 59209* at VDB and to be distributed).

This is distinguished from other shrubby *Dicerandra* by its roseate, unspotted corollas. Other woody *Dicerandra* have more sharply geniculate corollas that are whitish or yellowish-white with purple maculation. Also, *D. immaculata* calyces are usually very purple-tinged with orifices usually deeper in color. The cymes are shorter-peduncled, the pedicels shorter, the inflorescence thus more dense. The effect is more that of a shrubby *D. densiflora*. The plants are abundant locally within a small area encompassing southeastern Indian River County and northeastern St. Lucie County along

1dm
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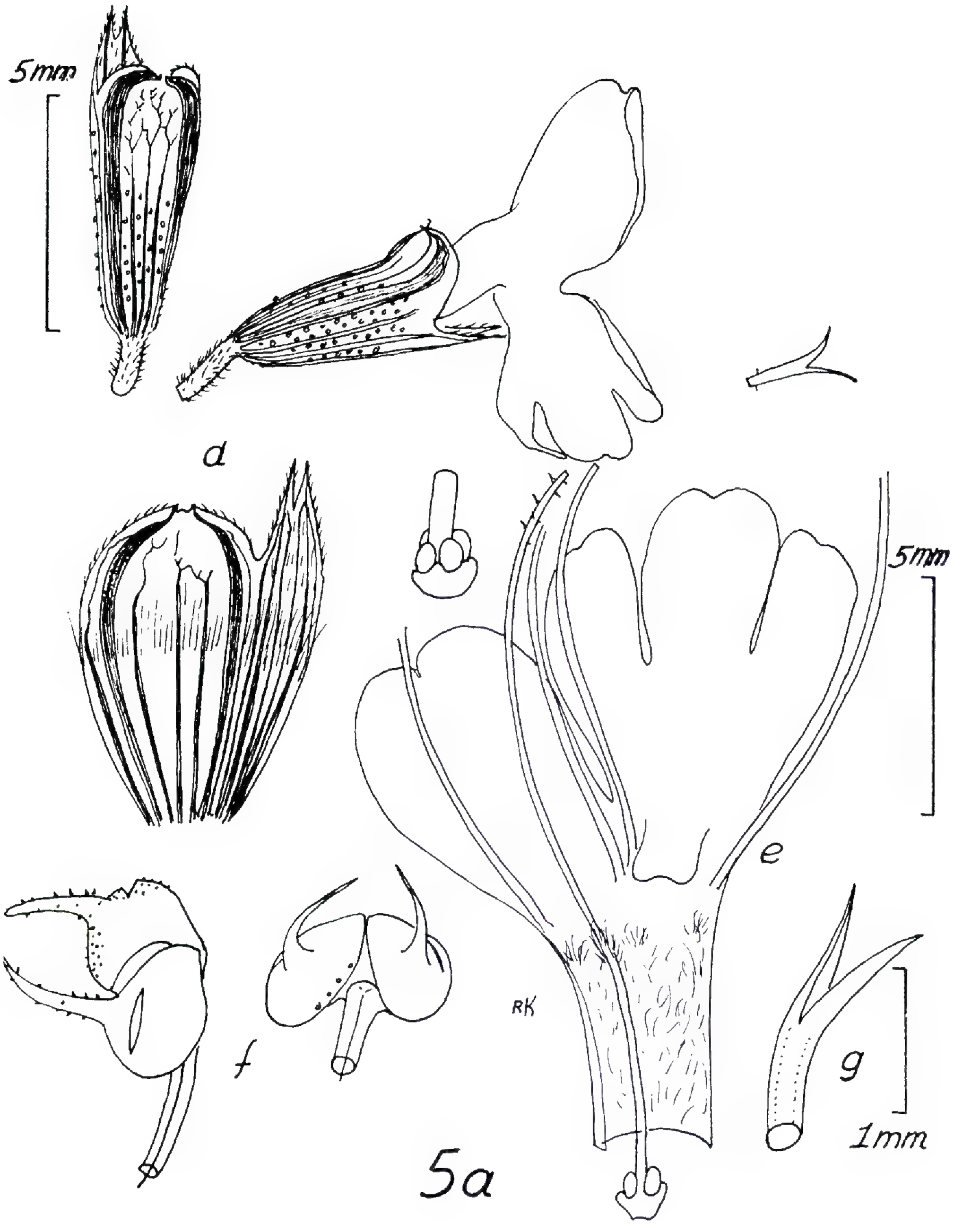
5



5a

Fig. 5a. *Dicerandra immaculata.* d. calyx; e. spread corolla with lower part of tube removed; f. two views of anther; g. stigmatic zone. From *Kral 95309.*

Fig. 5. *Dicerandra immaculata.* a. habit sketch; b. one cymule and node; c. oblique view of corolla (upper left), front view of flower (lower left), side view (lower right). From *Kral 59309.*

a line of ancient dunes largely forested by evergreen scrub oak, sand pine and Florida hickory. They particularly abound in sandy open areas such as blowouts or artificial or natural clearings but become much more straggly and weak as woody plants and saw palmetto invade. Historically, fire and wind action must have provided and maintained area for the plants. In mass, *D. immaculata* is perhaps the showiest in the genus and, in that all plants known are on private land in a highly developing part of Florida, its future is doubtful.

5. DICERANDRA FRUTESCENS Shinners, Sida 1 (2): 89–90. 1962.

Dense or straggly low shrub to 5 dm, with branches elongate from a deep, stout, spreading-branching taproot, the older branches mostly spreading, even prostrate. Shoots dimorphic, one type strictly leafy and overwintering, the other type developing from latent axillary shoots on the former and floriferous, dying back toward base after fruiting; internodes as in *D. immaculata* but longer, thus the inflorescence more interrupted. Larger shoot leaves narrowly oblong-elliptic, linear-elliptic or linear-oblanceolate, subsessile, 1.5–2.5 cm long, 2–3 cm wide, flattish but somewhat fleshy, apically narrowly or broadly rounded, entire, not revolute, the upper surface dark green with midrib slightly impressed, the lower surface slightly paler with midrib slightly raised. Inflorescence elongated, interrupted, with internodes longer than subtending cymes at anthesis, at least 1/2 of the flowering shoot floriferous and cymules reduced to 1 (-3) flowers, the primary peduncle mostly 1–2 (-3) mm long, the pedicels slender, uparching, 4–8 mm long, these and peduncles finely puberulent, greenish. Calyx at anthesis ca 9–10 mm long, nearly erect, proximally and medially green, distally tinged with red and with a broad white zone around the orifice, the upper lip broadly rounded, shorter than the lower, which is 2.2–2.5 mm long, the sinus between the narrowly triangular-acuminate teeth ca 1 mm deep, the surface smooth save for annulus and lower lip within. Corolla 1.9–2.0 cm long, with tube erect, ca 7 mm long, internally villous, bent abrupt at junction with throat, sometimes at nearly a right angled or downward, with palate strongly raised at floor of lower throat between the anterior filaments, the upper lip broadly oblong or ovate, ca 8–9 mm long, emarginate or retuse, apically usually recurved, the lower lip downcurved, broadly obovate, 9.0–9.5 mm long with lateral lobes oblong, spreading and recurved, the medial lobe emarginate, angling downward or slightly recurved; external surface of throat and limb white or yellowish white, the upper lip marked internally with a trellis pattern of lines and dots of deep purple, the lower lip maculate with larger, concentric spots from lobe bases to base of lip. Filaments white, the short pair ca 12 mm, the longer pair ca 13 mm long, the anthers long-exserted, purplish, with horns smooth, 0.8–1.0 mm long. Style near white, above the middle hirtellous, bent forward or curved downward beyond the usually above the anthers, the stigmatic branches recurved, subequal. Figs. 6, 6a.

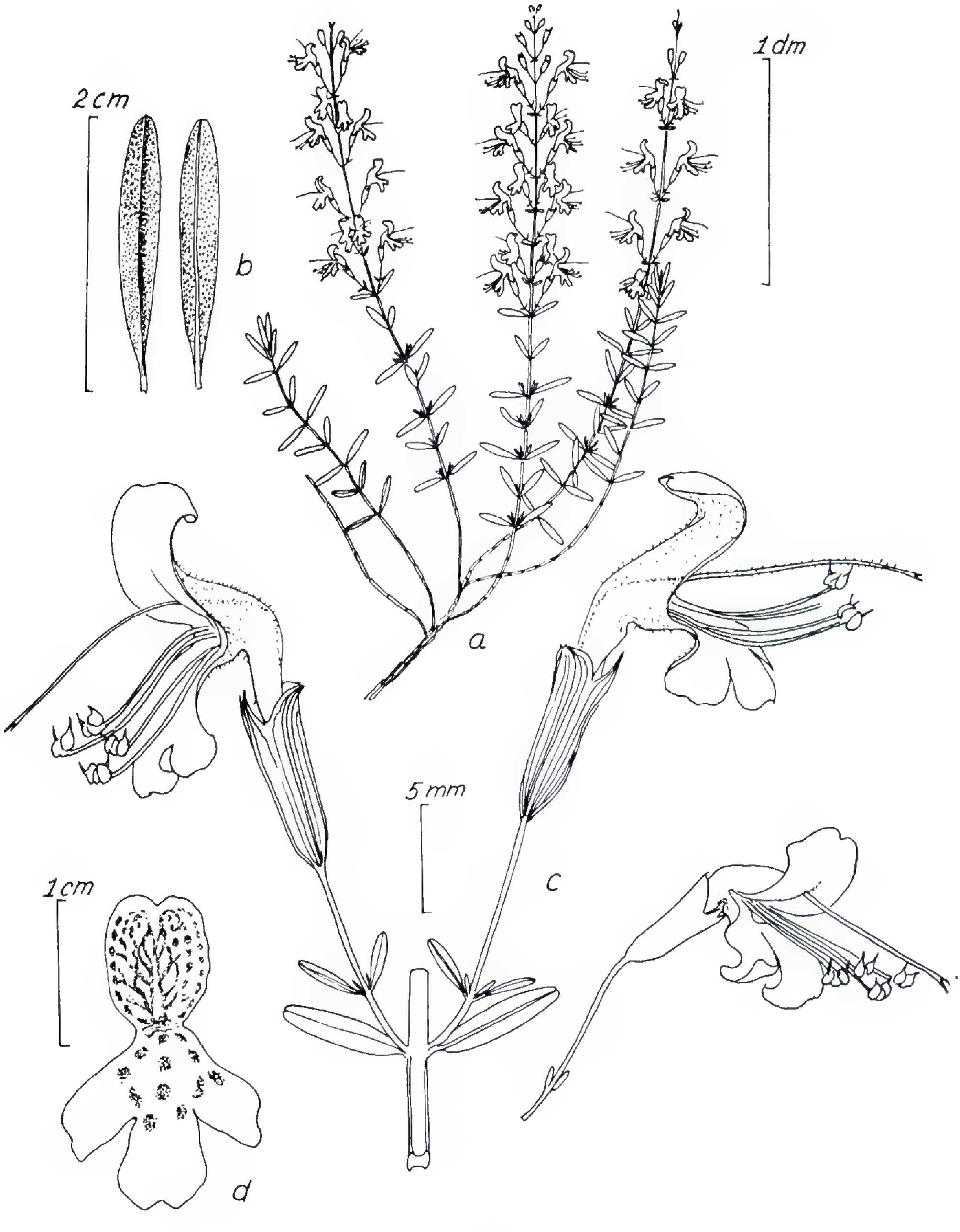
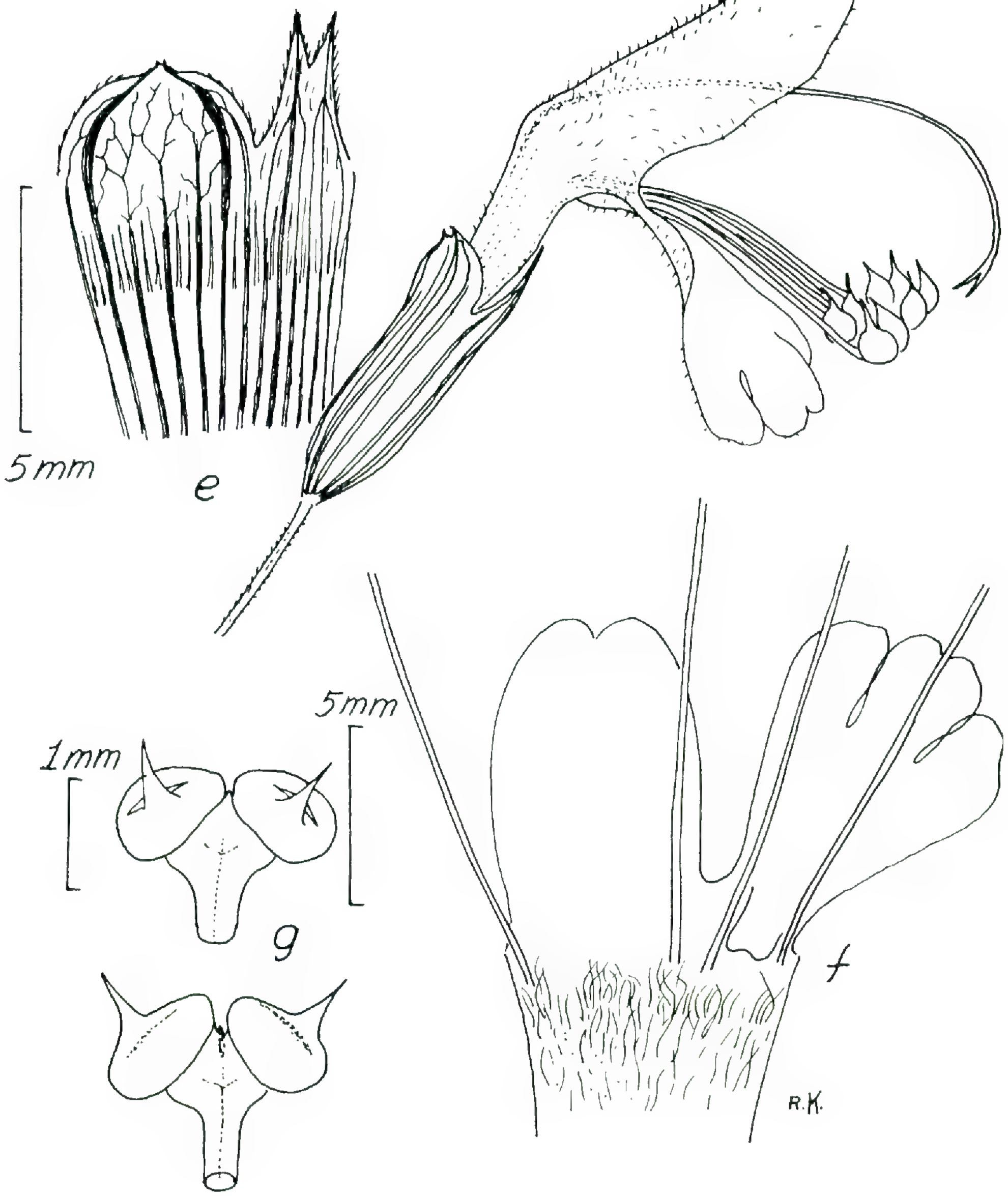


Fig. 6. *Dicerandra frutescens*. a. habit sketch of branch; b. leaf; c. flowering node, side and oblique view of flowers; d. front view of corolla. From *Kral 66201*.



6a

Fig. 6a. *Dicerandra frutescens.* e. spread calyx, side view of flower; f. spread corolla with lower tube removed; g. two views of anther. From *Kral 66201.*

Sand pine-evergreen scrub oak sandhills, usually in small clearings, southern peninsular Florida south of Sebring. Flowering from August to February. Fig. 8d.

TYPE: FLORIDA. Highlands Co.: sandy scrub 20 mi S of Sebring along Rt. 27, 28 Aug 1953, *F. H. Sargent 6600* (HOLOTYPE: SMU; ISOTYPE: GA!).

Additional material examined: sandhills near Lake Stearns, 8 Jun 1925, *Small & Matthaus 11613* (US!—plant in late fruit, showing overwintering leafy shoots); very abundant on roadsides in sandscrub, rte 8-A, Hicoria, 16 Feb 1945, *Brass 14646* (US); gregarious locally in sandscrub, Lake Placid, 9 Sep 1945, *Brass 15604* (US); ca 1 mi E Childs and ca 1/2 N of Fla. 70; sandy ridge, edge of sand pine wood, 20 Aug 1980 *Kral 66201* (VDB; sample to be distributed).

The sandhills scrub around Lake Placid and Childs where this shrub once was locally abundant is so rapidly being converted to orange groves and housing developments that the species is definitely endangered!

6. DICERANDRA CORNUTISSIMA Robin Huck, Phytologia 47(4): 313–315. 1981.

Shrubby as in *D. frutescens* but sterile innovations more numerous, on healthy specimens forming dense low mats, these overtopped by the numerous, more erect, floriferous shoots. Leaves narrowly linear, mostly ascending, the larger ones mostly 1.5–2.5 cm long, 0.8–1.5 mm wide, firm, apically notched, the margin entire or very slightly wavy, the base nearly sessile. Flowers (1-) 3 (-5) per cyme, the calyx ca 9–10 mm long, the corolla less exserted, ca 13 mm long, the tube ca 6 mm long, there sharply bent below the throat, with limb usually declinate, the upper lip bent upward or reflexed, 5.0–5.5 mm long, the lower lip obovate, ca 8 mm long, directed downward, the lobes at tips recurved, the surface white, externally puberulent above the tube, internally with upper lip strongly maculate with concentric, trellis pattern, dots and lines of purple, the lower lip with fewer and larger spots medially and proximally. Anthers white, the horns ca 1.5 mm long. Fig. 7.

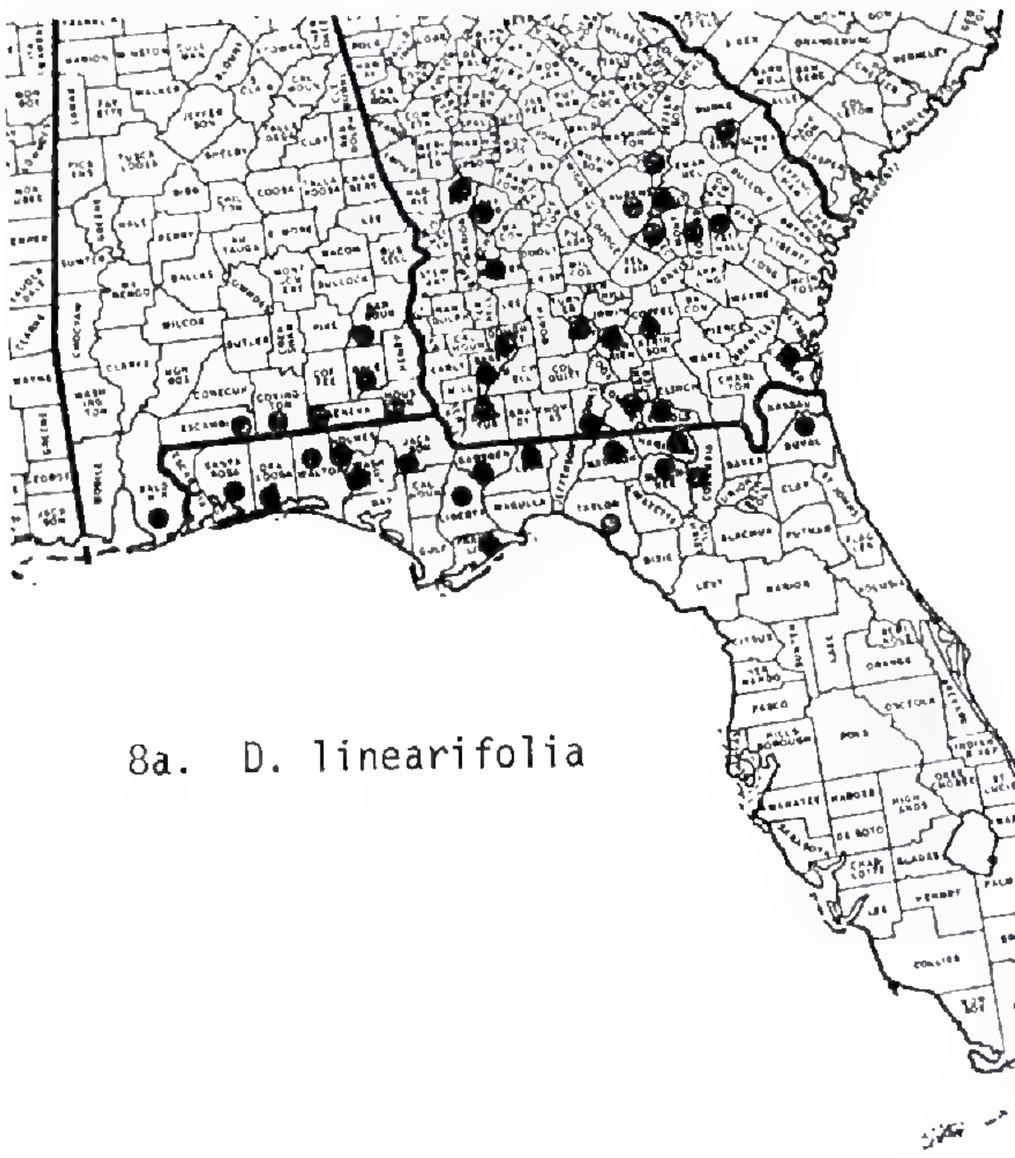
Sandy clearings in sand pine-evergreen scrub oak scrub, northern peninsular Florida; flowering from August to early October. Fig. 8d.

TYPE: FLORIDA. Marion Co.: 0.8 mi W of intersection of Fl. 484 and I-75 on Fl. 484, north-south ridge, oak scrub, 19 Sep 1980, *Huck 2436* (HOLOTYPE: NCU).

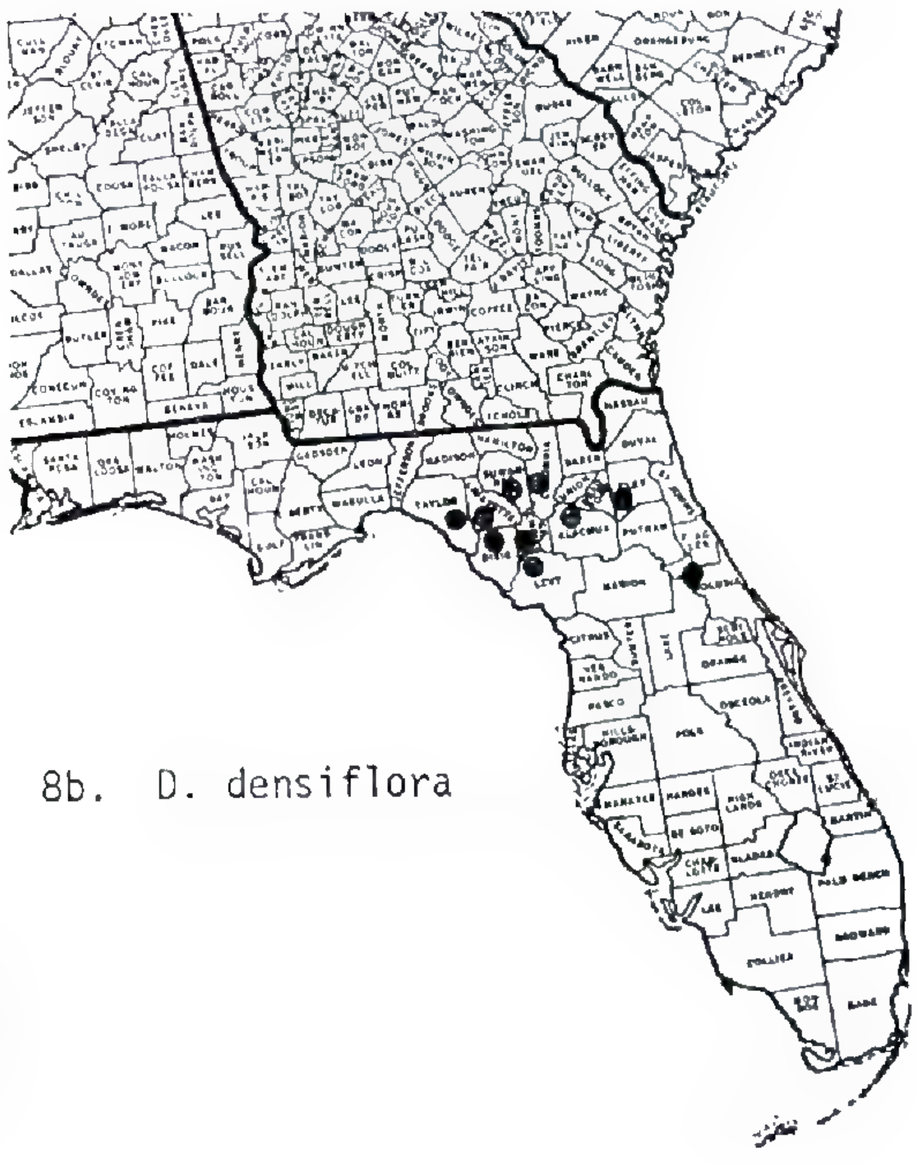
Additional collections: Marion Co.: forming circular mats on sandy clearings in sand pine by I-75, 6 mi S jct. Fla. 200, S of Ocala, 4 Oct 1976 *Kral 59258* (VDB); shrubby plants, strongly aromatic, on sandy clearings in sand pine-evergreen scrub oak by I-75, 4 mi S jct. Fla. 200 (ca 8 mi S Ocala), 16 Oct 1975, *Kral 57175* (VDB—series to be distributed); Sumter Co.: low shrub of sandy clearings in scrub, ca 5 mi W Wildwood, live oak-saw palmetto type, 21 Oct 1977, *Kral 61257* (VDB, and to be distributed).

My own collections of this from Marion County appeared to me at first merely to be northern extremes of *D. frutescens* Shinners. Sumter County

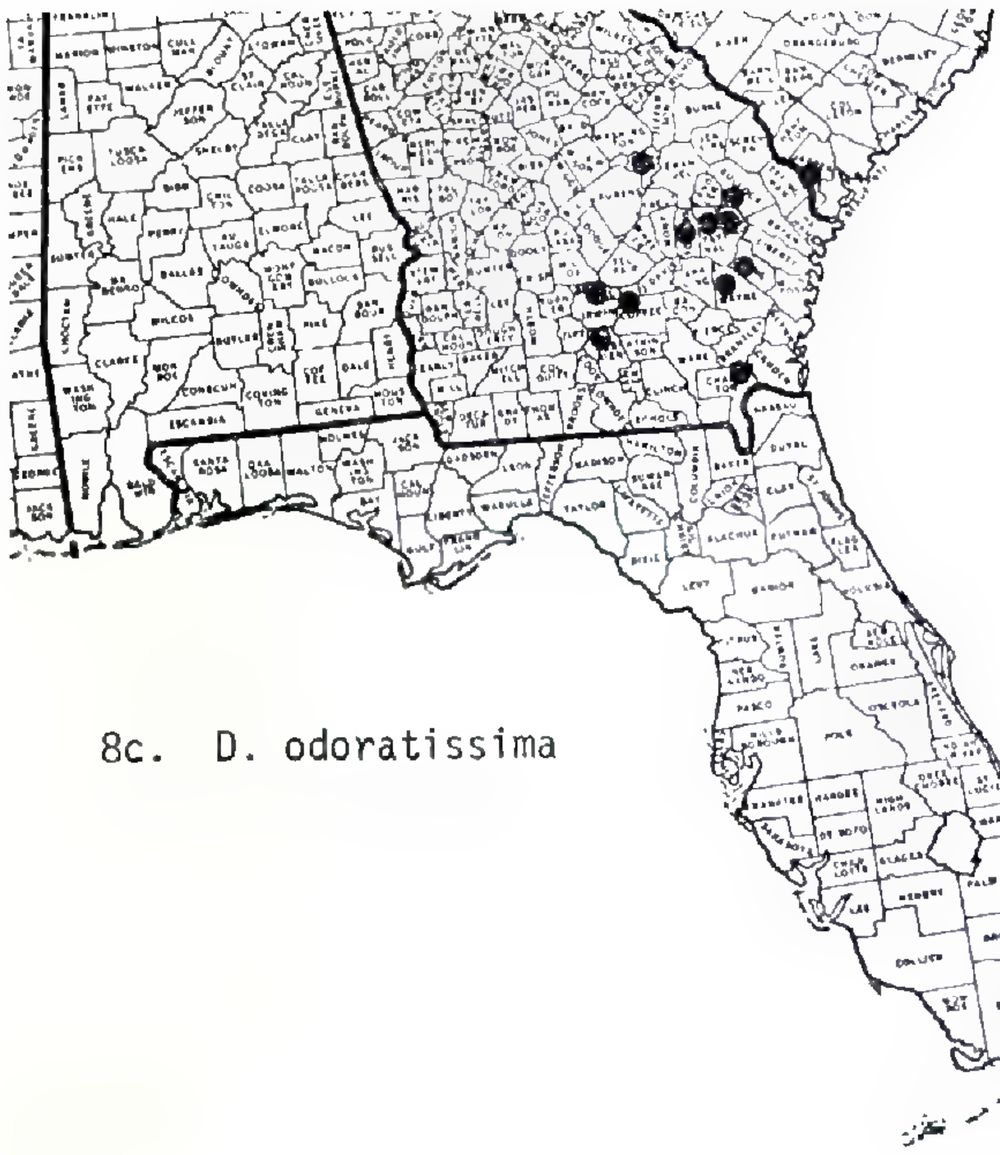
Fig. 7. *Dicerandra cornutissima*. a. habit sketch; b. leaf; c. pair of cymules; d spread calyx; e. front view of corolla; f. side view of flower; g. spread corolla; h. corolla viewed from beneath; i. two views of anther; j. nutlet. From *Kral 59258, 61257.*



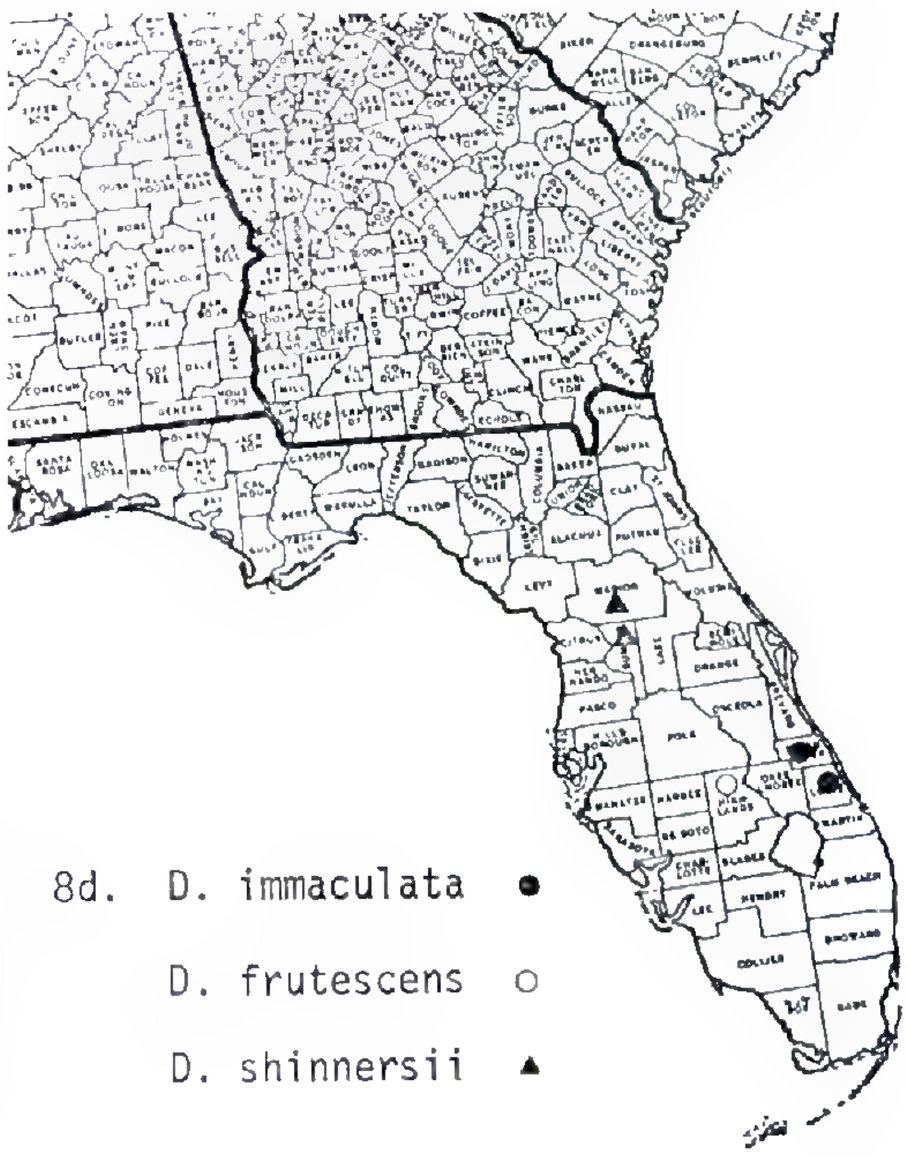
8a. D. linearifolia



8b. D. densiflora



8c. D. odoratissima



8d. D. immaculata ●

D. frutescens ○

D. shinnersii ▲

specimens at FLAS cited by Dr. Shinners looked the same. However the Marion and Sumter county specimens were from shrubs consistently denser in foliage, with narrower leaf blades, a more compact habit than true for Highlands County shrubs from which the holotype comes. While Highland County shrubs have cymes predominantly uniflorous, the "northern" popula-

tions are prevalently triflorous, with smaller corollas less exserted from the calyx, with more red pigment in the calyx, and with petals more heavily maculate. My own efforts during the 70's to find *Dicerandra* shrubs in the sandhills that extend ca 100 miles between Sumter County and Highlands County were not successful. The question then became one of deciding whether the northern shrubs are varietally or specifically distinct, or if the description rendered by Dr. Shinners simply would require some amplification. I finally decided that, while the ecological system in which the Highlands, Sumter and Marion County populations grow is essentially the same, the lack of evidence of populations intermediate in morphology and range was in itself evidence that a sufficient isolation existed to define a new species. Ms. Huck came more swiftly and independently to the same conclusion.

This shrub appears to react well to disturbance, is increasing along sandy cleared highway right-of-way, in powerline clearings, along firebreaks and in freshly clearcut areas.

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NOTES

GLYCERIA DECLINATA IN LOUISIANA—On 22 April 1981 Samuel Hebert collected a few specimens of a *Glyceria* from a rice field near Hathaway, Jefferson Davis Parish, Louisiana. The specimens were identified as *G. declinata* Brebiss, by Dr. Charles M. Allen. According to Hitchcock (1950), this species has been reported in the United States only in California, Nevada, and New York (Long Island), where it was probably introduced from Europe. Allen (1980) does not mention this species in Louisiana. Furthermore, it was not attributed to the aquatic and wetland flora of the southeastern United States by Godfrey and Wooten (1979). This collection then is new both for Louisiana and the southeastern United States.

Glyceria declinata is an erect to decumbent, rhizomatous perennial usually associated with wetlands. The spikelets resemble somewhat those of *G. septentrionalis*, which has been reported in Louisiana, but its culms are only 15 to 70 cm in length while those of *G. septentrionalis* are usually 1 to 1.5 m.

Collection data are: LOUISIANA. Jefferson Davis Parish: 1 mi due E of intersection of La 26 and La 102 in rice field at SE corner of intersection of La 102 and La 1128; 22 Apr 1981, *Herbert s.n.* Specimens have been deposited at the University of Southwestern Louisiana, Lafayette (LAF) and duplicates will be sent to AC, GA, LSU, MO, NLU, NY, SMU, TAES, and VDB.

We would like to express our sincere appreciation to Dr. William D. Reese for his assistance in preparing this note.

—*John K. Saichuk, University of Southwestern Louisiana, Lafayette, LA 70504; Charles M. Allen, Louisiana State University at Eunice, Eunice, LA 70535; Samuel Hebert, University of Southwestern Louisiana, Lafayette, LA 70504.*

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A NEW FORM OF *BIGNONIA CAPREOLATA* FROM WEST TENNESSEE.—A unique new color form of crossvine was discovered on a river terrace in extreme western Tennessee. This form is described as:

BIGNONIA CAPREOLATA L., forma lutea Heineke, forma nov.

A varietate typica differens corolla omnio canarina vice atroaurantiaca ad rubrum extra et aurantiaca pallida ad luteum intra faucem.

Differing from the typical variety in having the corolla entirely canary-yellow rather than deep orange to red on the outside and pale orange to yellow within the throat.

The type was found on a successional wooded block bordering a channelized stream west of Humboldt, Tennessee.

TYPE: TENNESSEE. Gibson Co.: alluvial ridge on southern bank of the Middle fork of the Forked Deer River, 0.9 mi SE of the jct of Tennessee Hwy 152 and the river, 13 Apr 1981, *Tom Heineke 2273* (HOLOTYPE: SIU; ISOTYPE: Memphis District Corps of Engineers Herbarium).

—T. Heineke, Environmental Resources Section, Memphis District Corps of Engineers, Memphis, TN 38103.

ISOETES BUTLERI (ISOETACEAE) IN TEXAS—In her monograph of the Isoetaceae, Pfeiffer (1922) recorded the distribution of *Isoetes butleri* Engelm. as Tennessee, Missouri, Kansas, Arkansas, and Oklahoma. Recently, the species has been documented as occurring additionally in Alabama (Kral, 1973), Kentucky (Baskin & Baskin, 1978), Georgia (Boom & Evans, 1979) and again in Oklahoma (Taylor & Taylor, 1981).

The present report documents a southwestern range extension for *I. butleri* of about 300 miles to the Edwards Plateau of Texas. An SEM examination of the megaspores of *Correll & M. C. Johnston 17313* (LL) from Llano Co. clearly indicates that the specimen is *I. butleri*, and not either *I. lithophila* Pfeiffer or *I. melanopoda* Gay & Dur. which are also known from the area. The megaspore ornamentation is completely consistent with that described and photographed by Taylor et al. (1975). The known distribution of *I. butleri* is shown in Figure 1, and is based upon the specimens examined by Boom (1982), and those reported by Taylor and Taylor (1981). Although reported by Pfeiffer (1922) as also occurring in Kansas, no specimens of this species from that state have been seen by us. It is certainly to be expected there, however, particularly in limestone areas.

Isoetes butleri nearly always seems to be restricted to shallow, calcareous soils. However, as Taylor et al. (1975) discussed, the species has been documented as occurring on sandstone. In these unusual situations it has been suggested that the standstone substrate may be cemented together by a calcareous matrix which, in effect, creates the normal pH conditions.

It appears that a parallel situation exists with *Correll & M. C. Johnston 17313*, which was collected "in moist soil over granite along the Llano River, 7 miles east of Llano." This apparently anomalous situation of a siliceous substrate can perhaps be explained by the fact that limestone underlies much of the granite in the Edwards Plateau (Correll & Johnston, 1970). Since the specimen in question was collected along a river, some exposure of this limestone would be expected. Indeed, other calciphilous plants are

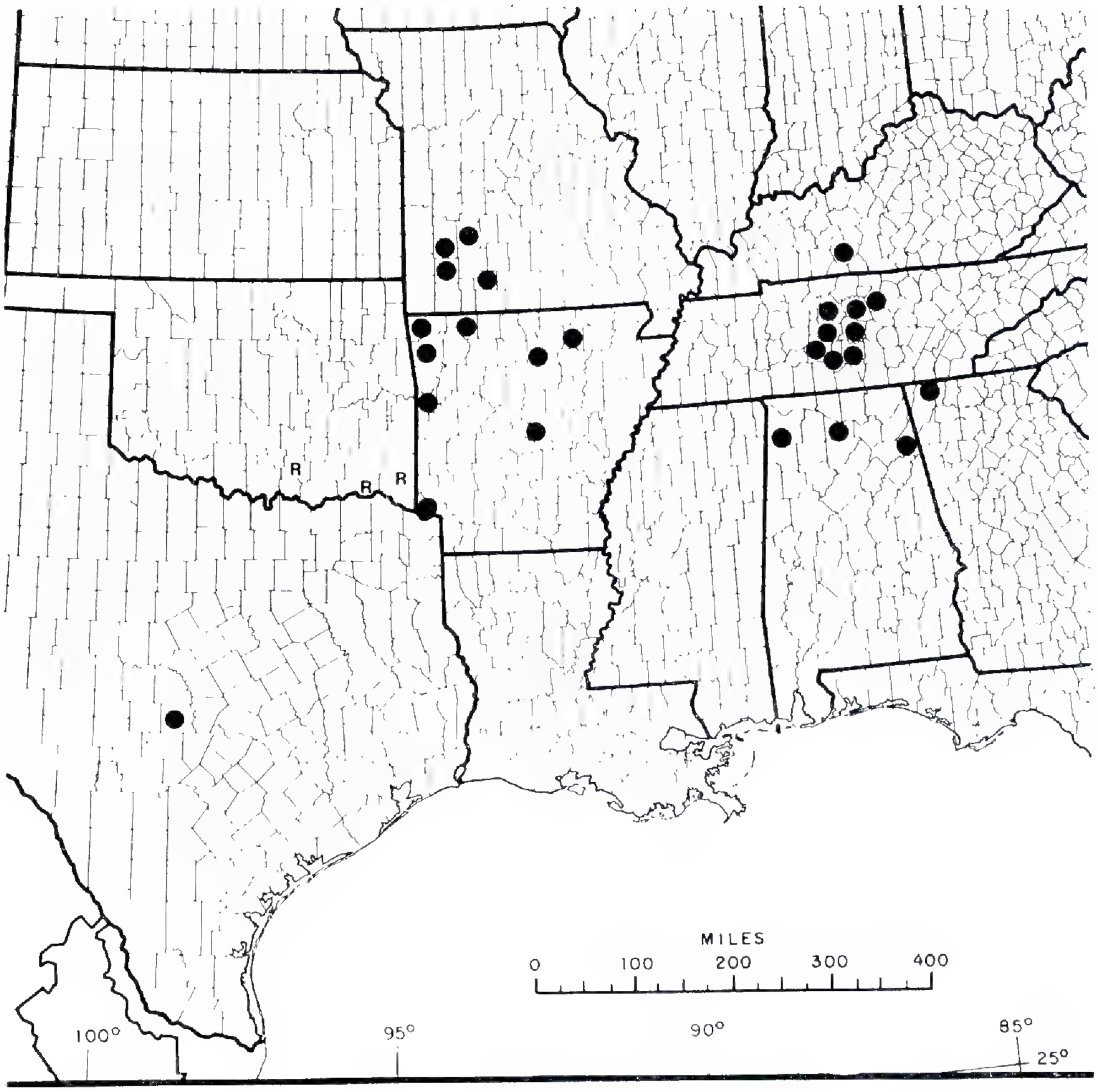

Figure 1. Distribution of *Isoetes butleri*. Closed circles represent the collections examined by Boom. R indicates collections reported by Taylor and Taylor (1981).

known from this region, such as *Grindelia texana* Scheele (M. Wetter, pers. comm.).

With this report of *I. butleri* from Llano Co., Texas, this county now appears to be a prime area in which to search for hybrids with either *I. lithophila* or *I. melanopoda*, both of which also occur there (Boom, 1979). Considering the relative ease with which quillworts can hybridize in some natural situations (Matthews & Murdy, 1969) and artificially (Boom, 1980), the prospects for the eventual discovery of hybrids involving *I. butleri* are good. Any putative hybrids should be confirmed by SEM examination of the spores.—*Emily J. Lott, Herbario Nacional, Instituto de Biología UNAM,*

Apdo. Postal 70-367, Delegación Coyoacán, 04510 México, D. F., Brian M. Boom, New York Botanical Garden, Bronx Park, Bronx, New York 10458, and Fernando Chiang, Herbario Nacional, Instituto de Biología UNAM, Apdo. Postal 70-367, Delegación Coyoacán, 04510 México, D. F.

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ARTHRAXON CASTRATUS (POACEAE: ANDROPOGONEAE) NEW TO THE NEW WORLD[1]—Recent collections from Puerto Rico showed that the known distributional range of *Arthraxon castratus* (Griff.) Narayan ex Bor has been extended to the New World. The population was collected in PUERTO RICO: Utado, on banks near Castaner at 400 m altitude, 25 Feb 1981, *Liogier & Liogier 31714* (TAES).

This is the first reported collection of *A. castratus* in the New World. In a monograph of the genus *Arthraxon* Van Welzen (1981) reported the distribution of the species to be India, Ceylon, southern South Vietnam and Java. Therefore, this is a several thousand km extension of the known distribution. The peculiar, disjunct distribution is possibly due to its rare occurrence or occurrence in areas with seasonal drought (Van Welzen, 1981).

Arthraxon castratus is an annual grass, up to 55 (-120) cm tall, with an inflorescence of 1–5 branches each 1–7 cm long. Only sessile spikelets are present, with a pedicel of the associated pedicellate spikelet. Except for margins of the second glume, both glumes are chitinous, the first glume with acute-bristle pointed spicules. Lemma of the upper floret is entire

[1] This is Technical Bulletin No. T.A. 17421, Texas Agricultural Experiment Station.

with long pilose margins and a subbasal awn 6–10 mm long. Palea of upper floret is 1–2 mm long.

The species, *A. hispidus* (Thunb.) Makino, synonymous with *A. quartinianus* (A. Rich.) Nash, is considered introduced into the New World. Several regional floras document the presence of this species including Pohl (1980), Gould (1979), Chase (1951), Hitchcock (1935, 1936), and Nash (1912). Van Welzen (1981) in a generic revision reported New World *Arthaxon* to be limited to *A. hispidus*.

The New World species can be distinguished by the following key:

Palea of upper floret present, anthers 3, margin of lemma of upper floret pilose ..... *A. castratus.*

Palea of upper floret absent, anthers 2 (rarely 3), margin of upper floret glabrous ..... *A. hispidus.*

—*Stephan L. Hatch, Department of Range Science, Texas A&M University, College Station, TX 77843.*

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A NEW LOCATION FOR *PORTULACA AMILIS* (PORTULACACEAE) IN THE UNITED STATES.—Judd and Wunderlin (1981) recently published the first account of *Portulaca amilis* Speg. in the United States. The species is widely distributed in South America and occurs in Florida, Georgia, South Carolina and North Carolina according to Judd and Wunderlin. These authors cite a list of representative specimens from Florida all of which are found in the central or northern part of the state.

I've recently collected *Portulaca amilis* in southern Florida about 145 miles south of Polk County (Broward Co: Pompano Beach, S30, T48S, R43E, ca 0.5 mi E of US Highway 1 and 0.25 mi N of 14th Street Causeway in Caliban Boat and Trailer Park, 15 May 1980, *Bennett 391*, FAU). Polk County was the southern most location cited by Judd and Wunderlin (1981). Several individuals were found in a disturbed field, on well-drained sand, in Pompano Beach, Florida. Two other species of *Portulaca, P. pilosa* and

P. oleracea were also found at this site. *Bradley C. Bennett, Department of Biological Sciences, Florida Atlantic University, Boca Raton, FL 33431.*

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JUDD, W. S. and R. P. WUNDERLIN. 1981. First report of *Portulaca amilis* (Portulacaceae) in the United States. Sida 9: 135–138.

ERRATA

SIDA 9(2): 124-134. 1981. Robert Kral. Notes on some "Quill"-leaved Umbellifers. The legends for figure 1 and 2 should be reversed. (Fig. 1 = *Ptilimnium nodosum*; Fig. 2 = *Oxypolis canbyi*).

SIDA 9(2): 139-146. Robert Cruden. New *Echeandia* (Liliaceae) from México. The citation for *Echeandia flavescens* is repeated under *E. nana* making that combination invalid. The correct citation for *E. nana* is:

ECHEANDIA **nana** (Baker) Cruden, comb. nov.

Anthericum nanum Baker. J. Linn. Soc., Bot. 15: 305 (1876). TYPE: MÉXICO: 1830, *Graham 376* (K).

NOTICE

TITLE: An International Symposium and Workshop on the Application of Genetics to the Management of Wild Plant and Animal Populations.

WHERE: Hyatt Regency Hotel, Washington, D.C.

WHEN: August 9 through 18, 1982

FOR FURTHER INFORMATION CONTACT:

Christine Schonewald-Cox
Division of Natural Sciences
National Park Service—494
Department of the Interior
Washington, D.C. 20240

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SIDA CONTRIBUTIONS TO BOTANY

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SIDA, CONTRIBUTIONS TO BOTANY
Volume 9 Number 4
Dedicated to
Delzie Demaree 1889-

This issue is dedicated to Delzie Demaree in honor of his contributions to the botanical sciences. The character as well as the contributions of this individual are expressed in the following tributes from some of his associates, students, and friends.

Dr. Demaree started collecting plant specimens in 1922 when he began teaching at Hendricks College, Arkansas. His ability to collect and process over 75,000 numbers during the period of the evolution of the automobile without succumbing to the status symbol of that period is quite remarkable. He owned one 1917 Ford which he gave to his sister three weeks later. The processing of over one-third of a million sheets (based on a rough estimate of 5 duplicates per number) with a most meager budget is also incomprehensible.

In the 1950's, he donated his herbarium to SMU and this institution now has over 50,000 of his specimens. While a large portion are from Arkansas, he collected extensively in the southeastern states and Arizona, Missouri, Ohio, Oklahoma, and Texas. A great portion of his field work was directed toward the research interests of fellow botanists.

During a recent visit, he was interviewed by B. L. Lipscomb and myself. This data is summarized in the Biographical Sketch.—WFM.

BIOGRAPHICAL SKETCH

PERSONAL DATA

Born In Benham, Indiana, 15 September 1889: Married Catherine Lane; 3 children.

EDUCATION

Danville High School (Central Normal College) 1912.
B.S. (Botany), Indiana University 1920.
M.S. (Botany), Chicago University 1921.
Forestry course, Yale University 1923.
Ph.D. (Botany), Stanford University 1932.

TEACHING POSITIONS

Common Schools, Benham, Indiana 1914-1915; High School, Westpoint, Indiana 1916-1917; Hendricks College 1922-26; Yale Forestry School (two summers of Dendrology) 1924-1925; University of Arkansas at Fayetteville 1926-1930; Texas Tech, Lubbock, Texas (one quarter) 1934; Monticello A&M 1936-1946; Arkansas State University at Jonesboro 1946-1953; Navajo & Hopi Indian Reservation 1953-1956; Gulf Coast Research Lab, Ocean Springs, Mississippi (3 summers) 1956-1958; Tulane University (summer field trips, 3 years).

MILITARY EXPERIENCE

U. S. Marine Corp, April 1917-May 1919, served in France, 2nd Division.

SIDA 9(4): 269–286. 1982.

PUBLICATIONS

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Delzie Demaree. Photograph taken in 1919.

DELZIE DEMAREE: A TOP-FLIGHT FIELD BOTANIST—Delzie Demaree arrived on the Stanford campus in the spring of 1930. To my knowledge, there had been no preliminary inquiries about course offerings, opportunities for advanced study, available grants, or fellowships. No one in the Botany Department knew Delzie, but he made a very favorable impression with his detailed and intimate knowledge about the plant systematics and ecology of the Reelfoot Lake region, where he had done extensive field studies. He arranged to work toward his Ph.D. under the supervision of Dr. George J. Peirce, the Department's plant physiologist.

During the winter and spring of 1930 I had experienced a trying time with a student who started on a field trip with me into Baja, California, had tired of the monotony (to him) of collecting plants, putting them into presses, changing driers periodically, and eating "camp grub." Following a short discussion, I took him back over 150 miles to Tijuana, where he caught a bus for Stanford, and I continued field work for six weeks alone.

My plans for the summer of 1930 included a collecting trip into the Sierra San Pedro Mártir, and when Delzie volunteered to go along I was delighted to have an experienced field operator as my assistant and companion. Delzie proved, on that field trip, to be one of the best field collectors and camping companions I had had from that day to this!

We left Stanford early in August, drove to Tijuana, crossed into Baja California, and on the southern outskirts of that city, left paved roads and began to drive over rocky, dusty, rutted gravel roads to San Telmo. We camped one night on the upper beach near Cape Colnett, where Delzie was fascinated by the intricate branching and intertwining of the tentacle-like huge holdfasts of giant kelps that washed ashore. He examined several of them, noting the structure and interrelationships of the tendrils to the rocks to which they were attached, and the numerous marine organisms that dwelt within the tangled masses.

At San Telmo we turned east and drove over an even rougher, steeper, road to Meling's Ranch. There we learned that the Meling family was living in their summer Cattle Camp at La Encantada in the high Sierra San Padro Mártir, and that there were not enough pack and saddle animals at the foothill ranch to engage for the trip into the mountains. Only an elderly Indian and a dwarf vaquero were at the ranch. After some dickering, Chapito, the vaquero, consented to let me walk along with his pack string as he returned to the summer camp with fresh supplies for the Melings and their vaqueros. I hoped thereby to strike a bargain with Salve Meling for pack and saddle animals to transport Delzie and me, with our camping and collecting gear, to the mountain camp an uncertain distance from the valley ranch. Chapito would say only that the Cattle Camp was only "poco lejos" —a short distance—from the Rancho.

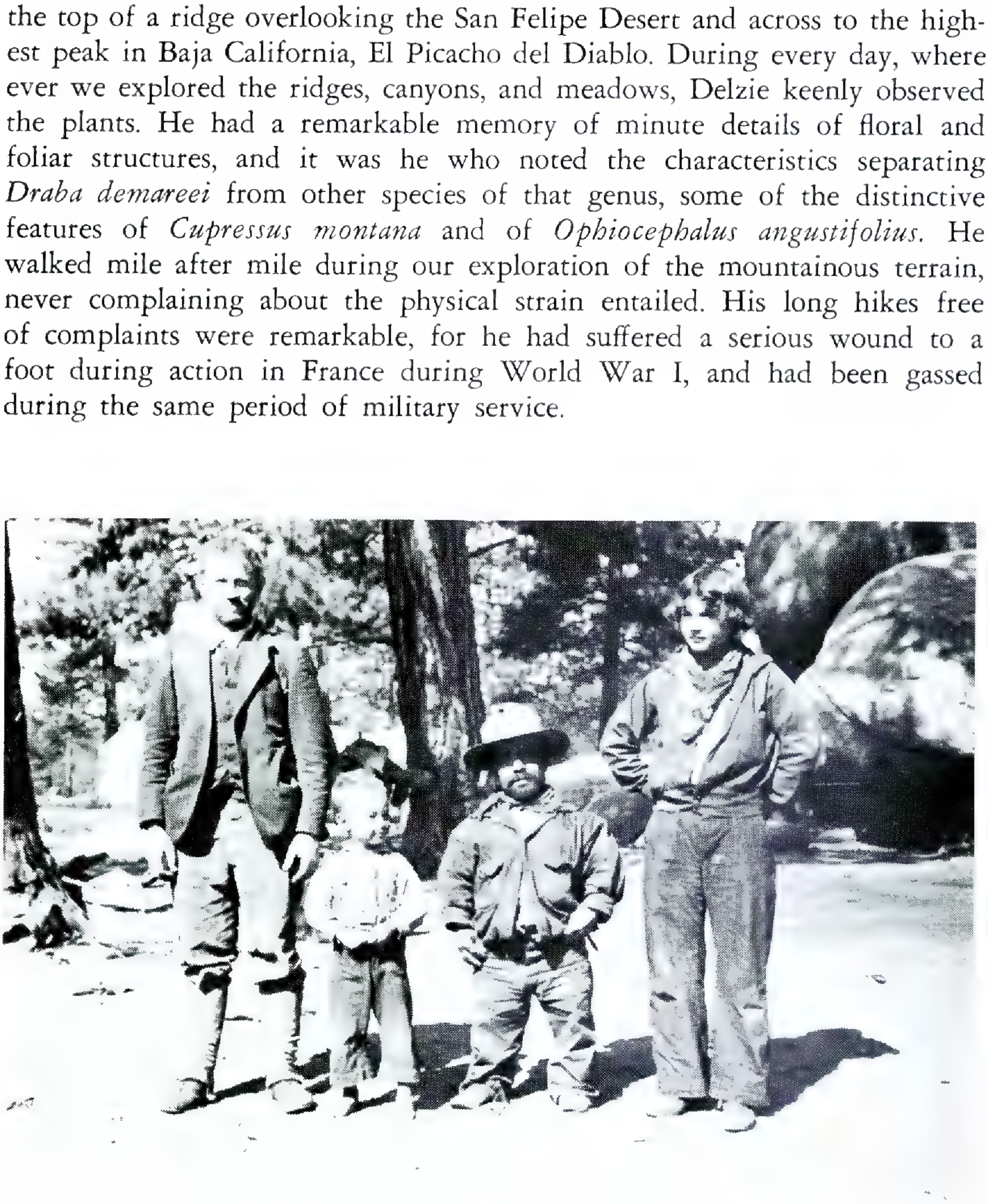
There seemed to be no alternative to the hike, so Delzie agreed to stay at the Rancho and collect anything that looked interesting during the two

Delzie Demaree with holdfast complex of *Nereocystis* on beach near Point Colnett.

days required for me to make the round trip to the Cattle Camp. Accordingly, Chapito and I left before sunrise the next morning, he riding at the head of a string of half a dozen pack animals laden with fresh roasting ears, string beans, potatoes, chili peppers, apples, peaches, and other supplies from the Meling's garden and orchard. I walked at the tail end of the string. Chapito gave the animals an hours of rest at Los Encinos while he brewed a cup of coffee for his lunch. Again he assured me that it was "poco lejos" from Los Encinos to the summer camp. We reached it at 7:30 that evening!

Delzie kept his promise about collecting, for he had a good number of sheets in press when we returned the next day. Chapito came along to serve as guide and packer when all three of us rode on the way in to the mountain camping area of La Encantada. Delzie had done little horseback riding, so the 35 mile ride to La Encantada was not too comfortable for him, but he complained not one whit about the discomfort of the saddle.

During the following month we explored the country within a radius of five or six miles, and from a level of about 7,200 feet above sea level to the top of a ridge overlooking the San Felipe Desert and across to the highest peak in Baja California, El Picacho del Diablo. During every day, where ever we explored the ridges, canyons, and meadows, Delzie keenly observed the plants. He had a remarkable memory of minute details of floral and foliar structures, and it was he who noted the characteristics separating *Draba demareei* from other species of that genus, some of the distinctive features of *Cupressus montana* and of *Ophiocephalus angustifolius.* He walked mile after mile during our exploration of the mountainous terrain, never complaining about the physical strain entailed. His long hikes free of complaints were remarkable, for he had suffered a serious wound to a foot during action in France during World War I, and had been gassed during the same period of military service.



Delzie Demaree, Andrew Meling, Chapito, and Mary Meling at Meling's summer camp at La Encantada, Sierra San Pedro Mártir, Baja California.

Delzie examined the intriguing expulsion of the mucilaginous-coated seeds into the air when the twig upon which the parasite grew was vibrated by a passing breeze or by the touch of a bird or mammal. He watched the explosive action of ripe fruits of the pine mistletoe, *Arceuthobium campylopodium*, whenever we were at our camp, so by the end of our stay he had enough first hand information about the distances that seeds were propelled, how they stuck to twigs, and the manner in which the germinating roots entered tissues of the host, to have written an informative account of that mistletoe. He also compared the pith and vascular tissues of the native grape with similar structures of wild grapes in the central U. S.

Delzie knew so much about native plants in the Mississippi Valley that he frequently discussed the similarities of some species and the wide differences among those of other families. He accurately remembered the appearances of each plant he collected, so he immediately recognized any species he had not previously collected in our area.

Upon our return to Stanford he helped me get all our specimens ready for distribution—in sharp contrast to the manner in which some aides had avoided such work after completion of a field foray. His work with Dr. Peirce kept him fully occupied, so I had few opportunities to discuss "systematics" with him during the rest of his stay at Stanford, yet when he returned to Arkansas he again turned to collecting herbarium specimens!

Delzie did most of his field work by taking a bus to an area, then walking many miles, carrying his press in a back-pack, staying at modest motels or sleeping in the woods. He knew the discomfort of attacks by chiggers and ticks, days of high temperatures and high humidity, of occasional violent storms, and chilly nights. Yet he persisted in his study of native plants. Less than ten years ago he wrote that his collection numbers had risen into the 66,000's!! Such a high number is reached by few botanists, especially by one who operated with as few mechanized facilities as did Delzie.

He was, and is, a confirmed optimist, a cheerful individual, one who rarely shows anger, and takes each day as it comes. He helped me immeasurably during our tour together, and I am glad to still call him "A Top-flight Field Botanist"!—*Ira L. Wiggins, Professor Emeritus, Stanford University.*

Dr. Delzie Demaree is a most unusual man, and it is an honor to be asked to join in a tribute to him. It is fitting that Sida be the vehicle.

I doubt that there is a field botanist in the south or southwest that does not know Dr. Demaree or at least know of his work. A good way to learn the scope of that work is to visit SMU, where the bulk of his collections is represented. One may find there that Demaree's field experience encompasses most of the United States, particularly the southern parts from California to the Atlantic, with a concentration on Arkansas, state of his personal choice and longest residence. The specimens are mainly of excellent

quality and quantity, the documentation most useful once one understands the unique and pithy character of the collector.

Many have gotten into the field with Dr. Demaree, and those of us who have hold very good memories. My own impressions have been that he is a fountain of field lore and pungent commentary on botany and botanists, has a humor that blankets the present and the past honestly, indiscriminately, and kindly. He has been a true friend to anyone who likes field work with plants. While he may not be cited much in titles of literature on plants of the South, he is very much present in that literature—sometimes credited, often not. In that taxonomists still have to shape their ideas around specimens, and because Demaree has been such an avid and productive collector for more than half a century, he will be remembered long and well.

In Dr. Demaree we are reminded of what it is to be true to the primary ideal. For many years he has done what he wants to do, to get out and see the country he loves, to gain the knowledge that comes with close field experience, to put good information into the hands of those who can pass it along. He is what he is, and we have all gained by that. He might be quite surprised to know how much we like him for doing just what he has wanted to do for all these years!!—*Bob Kral, Biology Department, Vanderbilt University, Nashville, TN 37235.*

I'll never forget the first time I saw Dr. Demaree. It was during the summer of 1964, and I had been working at the Science/Engineering Library at SMU for only a couple of months. Filing those cards at the Circulation Desk is a dull job at best, so I glanced up everytime the front door opened.

This time I was rewarded—for in walked a real field botanist, loaded down with bag and baggage and a tremendous plant press—and a laugh in his own good natured voice. I was especially interested to learn that he had come from my state and knew a number of my old friends.

I looked forward to Dr. Demaree's visits to the Herbarium, for he kept me up to date on the hickory nut crop in Arkansas and the developing colors of the autumn leaves.

Dr. Demaree is truly a remarkable and entertaining man: I wish there were more like him.—*Mary H. Wathern, 3632 Haynie Avenue, Dallas, TX 75205.*

OLD SCRATCH—It seems as if Delzie Demaree must have been around forever. After all I have in my possession the gift of the helmet and gas mask dating from his military service in France during World War I, before I was born. I have known him myself all my professional life, which totals more than three decades. Known to many as Old Scratch, he has always been devoted to the collection and study of plants, much interested in helping others with similar interests. He has been especially active in sending specimens to students of special groups or professionals for critical identification and enjoyed keeping, even comparing, lists of determinations. I have

heard him recount early experiences related to botany at the University of Chicago and at Stanford, as well as stories and incidents pertaining to early botanists and plant enthusiastics from Arkansas to New York and New Mexico.

Dr. Demaree is notorious. He led classes fearlessly through forest, field, marsh, and stream. He was known to stomp a rattlesnake or moccasin in the safety of his laced up, knee high leather boots. He was even known to catch poisonous snakes occasionally with his bare hands while holding them underfoot. He enjoyed an old fashioned coon hunt and could stay out all night, after a hard day of collecting plants, listening the the bark of the hounds in pursuit, their howl when the fleeing animal was treed. On field trips he collected plants by the scores, duplicates of some up to twenty—any kind of plant: big, medium or small; tree, wildflower or weed. He had no use for a vasculum, often ridiculing another's use of that ungainly contrivance. He collected plants in a cardboard box, held by a belt-like strap, if he did not press the plants on the spot in his rugged, beat-up field press. Plenty of cool drinking water was his main requirement on hot field trips and he often spent long hours at night processing plants not pressed in the field. He rarely ever delayed taking care of the material collected, being prompt to number, press and dry the specimens and to document the collection data. He discarded newspapers printed with comic strips. He reasoned that to use comics for pressing plants was to tempt an hourly wage earner, the mounter, to stop work to read, or better re-read the comics, whereas to discard them was to avoid this temptation. Surely Dr. Demaree deserves a share in Trailways and Greyhound by now, for these represent the principal means by which he travelled all over the country, often pulling the cord to signal the driver he wanted to get off in the middle of nowhere, wherever he happened to see plants he wanted to collect. After collecting them, he'd simply wait for the next bus.

To relate one incident will suffice to illustrate his interest in helping aspiring plant taxonomists, an incident involving me. It occurred in the early developmental years of the Gulf Coast Research Laboratory at Ocean Springs, Mississippi. I had known Dr. Demaree only two or three years when this incident occurred, having originally made his acquaintance at the Laboratory while collecting and identifying plants in the vicinity as an instructor from Mississippi State.

One day after a hard field trip in the pineland savannas Dr. Demaree asked me if I would lend him ten dollars. I tried to conceal my surprise, for I was certain he knew that something like a total of ten dollars was all I had between me and starvation. I was a graduate student at Duke at the time, collecting *Marshallia* plants from Durham to Miami and westward to Ocean Springs. We'd just located and collected some of the plants for the first time in Jackson County, Mississippi, next to the Alabama line. We'd been out in my fifty-dollar 1939 Plymouth. It was souped up with ply-wood

Delzie Demaree with a plant of *Helianthus annuus* L. subsp. *lenticularis* (Dougl.) Cockerell near Santo Tomas, Baja California.

fender skirts and rubber mudguards and burned oil mightily, giving off a blue smoke not unlike the insecticide mist emitted from fogging vehicles used along the coast for control of mosquitoes. One of the four paper-thin tires had gone flat and we had to change it, using in its place an even worse one from the trunk, one with a knot on the side but still inflated. Anyway, upon being asked for the loan, I thought to myself: "That old man has been good to me. He's helped me to key out some hard-to-identify plants in Small's Manual and has taught me scores of plants in the field." Nevertheless, I was very dubious. After all, I thought: "What was he going

to do with the money and where did he go"? It was common knowledge around the Laboratory that periodically Dr. Demaree would mysteriously disappear a couple of times per week for several hours, even a half day at a time. About this there was much speculation but no real explanation. So, naturally, I was not particularly enthusiastic about lending him ten dollars, which, incidentally, was carefully folded and hidden among my belongings for use in an emergency or for hard times.

Dubious as I was concerning the loan request, somehow I couldn't say no. I couldn't even bring myself to ask Dr. Demaree for what purpose he needed the money. In something like a spirit of resignation, I dug out the bill and gave it to him.

That was a mistake, I concluded the next day when suddenly I was struck with the realization that Dr. Demaree was nowhere to be found. He'd disappeared! Naturally, I was concerned and a bit uneasy all that day and being preoccupied couldn't get much done, thinking as I did about the fate of my ten dollars and whether or not I'd ever see it again or Dr. Demaree himself for that matter.

Our work space at the Laboratory was a screened in 'bird cage', a substantial structure built over a slab of poured concrete. It had a roof of slate matching that of a three-story residence house near by, was equipped with hinged windows that could be propped up or let down. This lab was originally a sitting room accompanying the big house and was located near the entrance gate underneath a gigantic live oak tree, dripping with luxuriant festons of Spanish Moss. We'd built work benches and plant driers on the inside of three walls, a door occupying the fourth.

Late in the afternoon, about dusk, I was laboring over the identity of a certain *Rhynchospora* in this cage when I heard Dr. Demaree's characteristic voice calling, "Channell, Channell, Channell." He was coming in the front gate on foot, leather boots laced up to his knees. He call my name repeatedly. I was anxious to know what he wanted and rushed out toward him supposing something to have gone wrong. As I approached him, he held out his hands revealing several bills of various denominations, some tens, a twenty, fives, all sort of crumpled up. To my surprise and dismay, I presently learned he'd been across the bridge from Ocean Spring to Biloxi where he'd visited the bookies, had bet on the horses, and won enough money with my ten dollars to buy new tires all way round for my oil-burning Plymouth! Finally, I had an explanation for his disappearances, which I acknowledged as he smiled knowingly. I also realized he hadn't really needed ten dollars but somehow was testing me by asking for it to judge whether or not I would gamble on lending it to him.

I enjoyed many field trips in that old car on Dr. Demaree's tires, sometimes with Dr. Demaree, who never drove a car himself, but was always ready to bear or share the expenses of travel in someone else's car, that someone being a fellow botanist, a naturalist, conservationist or aspiring

taxonomist with whom he wished to associate and whom he wished to help.

This issue of Sida could not hold the countless stories and incidents related to this grand old man that I could tell. He is indeed, a phenomenon, a friend of plants of all kinds, an enthusiastic collector—Old Scratch, as he often signed his letters, which meant among other things that he was always ready to go, 'to scratch gravel' as he put, to go collecting. He is the last of another era of botanists, one of a kind, and yet ageless, even now much like he was when I first met him, full of stories and reminescences and always pronouncing the doom of botany, which is his way of looking at the changes through which the subject has gone.—*R. B. Channell, Department of General Biology, Vanderbilt University, Nashville, TN 37235.*

Delzie "Arkansas" Demaree brings to mind a verdict heard from a colleague: "He's a compulsive collector." Have we need of him? His counterpart is the rarity runner. Systematics needs both, but profits most from the compulsive collector. He does not selectively seek but amply samples. And samples best record the story. Not forgetting, Delzie, your twinkling blue eyes or zest for corn pone and gravy, or your yarns aborning; we have profited from your enthusiasm for that old plant press.—*Joseph Ewan, Biology Department, Tulane University, New Orleans, LA 70118.*

Dear Dr. Demaree: It is a pleasure to salute you on the happy occasion of the dedication of this issue of SIDA to you. Through your long years you have made a magnificent contribution to our understanding of the plants of North America, starting with your exploration of the mountain ranges of northern California and extending throughout the Southwest and South.

No student of the plants of these areas can achieve an appropriate level of understanding without access to your ample collections, which reflect so clearly your detailed knowledge of these plants.

Therefore, on this occasion it is most fitting and proper for us to salute you and to thank you for your fine accomplishments, which have been such a marvelous contribution for us all.—*Peter H. Raven, Director, Missouri Botanical Garden, St. Louis, MO 63166.*

IN TRIBUTE TO DELZIE DEMAREE—The scope of Delzie Demaree's influence on students of botany is indicated by a coincidence that occurred on the day that the letter arrived from the editor of *Sida* notifying me of plans to dedicate this issue to him. That same day, Stewart Ware of the biology department at the College of William and Mary was taking a visiting botanist, Dr. John DeTurck of Cabrini College, Radnor, Pa., on a tour of the College Woods. In the course of their walk, Dr. DeTurck inquired whether his guide knew Delzie Demaree. Upon receiving an affirmative response, DeTurck launched into reminiscences of how 20 years ago Demaree had been so generous in supplying him with specimens of the group he was revising, *Oenothera* section Kneiffia, and how Demaree had put him through rigorous

paces in their quest in the field as well. He mentioned, too, the bundles of *Oenothera* that had appeared periodically in his mail during the years that followed, these from the same indefatigable source. This story could be retold tens of times simply by changing the name of the botanist and the genus.

My own first encounter with Dr. Demaree was as an undergraduate at Southwest Missouri State College when he came to guide Paul Redfearn, Jack Sharp, and me on a field trip to the boot-heel of Missouri to see *Leitneria*. The friendship that began that day punctuated my graduate school years at Vanderbilt with shipments of *Valerianella* and with Demaree-brand field trips to Arkansas. To this day, his most recent collections of *Valerianella* continue to arrive in cutdown fruit or poultry boxes tied with binder twine. These specimens are pressed in newspapers current to the day of collection, and never in the comic pages (lest these tempt herbarium workers from their task). The specimen labels also bear his distinctive touch, with such informative exclamations as, "A fine patch!" appended to the basic field data. Underneath the bundle of plant specimens all manner of surprises may await, from perhaps a fine specimen of Arkansas gypsum or novaculite to selected newspaper clippings and jokes reflecting the Demaree philosophy. A recent clipping announced, "The greatest undeveloped territory in the world lies between your ears!"

Dr. Demaree is not only a botanical phenomenon, but this peppery ex-Marine is also a paradigm of plain toughness. However, it may not be reasonable to use his example as a standard; surely he is made of tougher stuff than most of us. He credits his vigor in part to daily inhibition of large quantities of ice-cold water, particularly mineral water from Hot Springs, and to abstinence from all milk products and from carbonated soft drinks, "fizz water" in his words. Each fall he purchases a "big ticket" on Trailways that allows unlimited travel over a period of several weeks, and he crisscrosses the eastern part of the nation, hitting the Systematics Symposium at St. Louis, then visiting assorted botanist friends state by state in a giant loop. On one of these odyssies a few years ago he made a misstep and tumbled head-over-heels down the stairway of the bus. His comment as he got up (all bones intact) and brushed himself off is pure Demaree: "Every now and then a fellow needs a good jostle to straighten himself out!"

Those who know "Old Scratch," as he is prone to refer to himself, know that he is a story-teller, tease, and talker *extraordinaire*. He will talk off an arm and a leg, detailing the state of the Union, "Things are all balled up!", and the state of the Art, "There is no royal road to taxonomy!" Perhaps my favorite of his stories is about how, with a little seed money from Ben Channell, he won enough money at the race track to buy new tires for Channell's field vehicle. His reputation also includes at least one favorite tale to hold over the head of each of his friends; in my case, he has been merciless with me about the time he caught me back at the car surreptitiously eating

cookies on a field trip. That was a serious infraction of his Code of the Field! He is even-handed, though, and tells tales on himself, too—like the story about losing his geologist's hammer on a field trip, only to discover later that in the process of using it to hold down newspapers on that windy day, he had pressed it right along with the plants.

There are so many of us who have benefited from Delzie Demaree's plant specimens, his field expertise, his phenomenal memory for plant localities, and his generosity in providing field trip headquarters at his house/herbarium in Hot Springs, Ark. (now transplanted to Detroit, Tex.). His many friends also know full well that his is a willing and empathetic ear when his counsel is sought. We enjoy his steadfast friendship and benefit from his encouragement and sound advice. Not only has he made a major contribution to the growth and development of botanical knowledge through his myriad collections and other botanical pursuits, but in his interactions with students he has contributed greatly to the professional growth and development of the botanists themselves.—*Donna M. E. Ware, Department of Biology, College of William and Mary, Williamsburg, VA 23185.*

I can recall my experiences with Dr. Demaree with ease. How lucky a few of us are to have had the opportunity to know and botanize with Dr. Demaree. My first experience goes back a little over seven years when I arrived in Dallas to fill the herbarium botanist position at SMU. Six days later I met him. I arrived at school about 8:30 a.m. and Dr. Demaree was waiting in his wool coat with his suit case and a full plant press. For the life of me, I had no idea who he was, but it didn't take long to find out. "My goodness, here it is, middle of the morning, and the herbarium still not open. I've had my breakfast and coffee and have been sitting here on these steps for two hours. When do you people go to work around here?" We went into the herbarium to carry on our conversation. Since then, we have been on several field trips together. The experience and fun I had with him in Arkansas was tremendous. Traveling down the road, he called out names of plants, places, habitats, people and everything else imaginable. He said, "Pull over around the bend. There's a little store we can stop at and get something to wet our throat." Sure enough, the store appeared around the bend. We went in and the first thing I heard was "Hello Dr. Demaree, how are the plants doing?"

Dr. Demaree, thank you for sharing so freely a part of your life with me. I look forward to every visit with you at the herbarium.—*Barney Lipscomb, Herbarium, Southern Methodist University, Dallas, TX 75275.*

He never taught me botany, but when I really needed it, he taught me wisdom. We met, by pre-arrangement, at a bus stop in the middle of my mid-life crisis and he rescued me by being his eighty-nine year old enthusiastic, determined self.

With all my spent and wasted ambition to create and demonstrate vital new world-changing technology, there I was spending days with a nineteenth century man, playing at taxonomy, a nineteenth century science. What Delzie let me experience, however, was his nineteenth century Thoreau-like value that let him be unabashedly happy picking weeds for plant

Delzie Demaree. Photograph taken in Lower California at the Hamilton Ranch in 1930.

morgues over the world. The image of Delzie, his boots, his fifty dollar "takes-me-anywhere-all-year" bus ticket, and his plant press, sucking in the joy of life and living sumptuously on next to nothing, still energizes my batteries and will; until I forget that a weed can be beautiful.

We spent hours not talking about politics, justice, business, esthetics, and people; talking weeds and ideas about weeds made much more sense.—*Anonymous.*

MY YEARS WITH DELZIE[1]—Posterity will see Delzie Demaree through the eyes of herbarium labels. Frankly, I believe this thought will do Delzie "real proud."

PLANTS OF ARKANSAS
COASTAL PLAIN REGION
Collected by DELZIE DEMAREE
Lafayette County

Carya texana Buckl.
30 in. D.B.H. Near June Lake. Last year no fruit.
This year loaded.
P.O. Stamps.
Elevation ft. 274.
Date 5-31-1975 No. 69592

There will never be any doubt where Demaree specimens were collected. Each one has its name, rank and serial number as you would expect from an ex-marine who traces his lineage back through twelve family members who have served since 1883 (3-30-69). One might question the insistence of tying collections to the closest post office in the same county, but no one will ever argue with his forester's eye for woody plants.

> "You must see this region. It is not like anything that [I] have seen. Soil could not be better and pecan trees (wild) 2-3 ft. DBH with 3-4 saw longs to a limb." (7-23-62)

This man known to me affectionately as "Old Scratch" epitomizes the Arkansas Traveler. From the time I first met Dr. Demaree at the Association of Southern Biologists meeting, Loyola University of New Orleans in April 1960 (5-25-60), I found him rarin' to go.

> "I will be ready to scratch gravel on Oct. 14 [1961] for a week." (9-5-61)

And over the years he maintained his traveling momentum with the $99/99 day Trailways special.

> "Let's make this a good tour of Ark. then a run around Okla., Mo., Ill., Ky., and wind up at Nashville (Tenne.)." (7-23-62)
>
> "I am leaving tonight for Ariz.—Oreg.—Wash.—Corvallis. My speed back will depend on when we can start our nutty trip." (7-23-62)

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[1] Bracketed dates refer to letters received from Delzie Demaree.

"Will meet you anyplace at anytime." (9-15-61)

"Before it is postmarked I will be on the way to pay U a visit. Schedule. Dallas—Flag—Vegas—L.A.—Miami—Vero Beach—Durham—Indianapolis—H.S. I will see you about the end of Nov. I want to get some *Hamamelis*. No big trips. I am on a $99 for 99 days." (10-21-63)

"Tijuana, Mexico. Got lost and am here after 2500 miles. On my way to Duke." (11-16-63)

What Delzie enjoyed most on these travels was sharing his knowledge about life and plants with students along the way and getting out in the field and bailing hay.

"They hit some good places, i.e. 50 numbers in two hours." (11-5-62)

"I am sending you 10 labels to make into sets of about 10. Your typing on your typewriter is very fine." (1-10-64)

As he was approaching the 47,000th collection number in the fall of 1962, his years of experience showed.

"I am now indexing my Ark. Plants on 4X cards and something is showing up. NOTHING. These plants can't read and just grow any old place." (12-17-62)

Perhaps the most unsettling aspect of his years of botanizing is the frustrating thought that it might have all been for naught.

"I never was so sick to see a place all messed up. Where they could contribute in taxonomy they are messing with ecology and physiology." (12-22-62)

"Taxonomy—the specimen way—is about out. No one working on them." (3-30-69)

"Taxonomy is so low that you have to reach up to touch bottom. Latest is that the Stanford Herbarium will go to the Cal. Acad. Science. You will be able to buy small herbaria for the price of the cases as old junk." (4-5-69)

A good flowering and fruiting year and plenty of ice tea has always been sufficient to bolster Delzie's spirits and bring out the best in sage advice.

"If there is no complex then there is no problem." (12-11-60)

"My gambling stops on Armistice Day. When your letter arrived in Vegas I was in Flag. You probably know less about horses than you do *Carya*. Probably several question what I know about horses and wonder that I do as well as I do. No doubt some wonder why a nut like you knows as much about *Carya* as you do. I don't play horses I play chart. I find something or some track that win under some standard way. I locate this and play until they win. For instance I got $93 bucks in one dollar bet. I tried to hit the big Internation[al] Race thinking the Russians might win it. I could not play old Kelso. He won and did not pay anything. I have caught some good ones on that big race when they win. I play parlays. That is one horse on the nose and all that goes on the next horse. You get some good payoffs. . . ." (11-26-64)

"Now this is where I made my mistake on oaks and hickories. Foster [Adriance S.] told me about 1928 or 9 that if I would collect only the oaks & hickories in Ark., science would never ask anymore of me. I did not do that good." (3-26-76)

I beg to disagree and so do his many amateur plant collector friends in

Dr. Delzie Demaree, 12 Jun 1973, tightening his plant press on Rich Mountain, Polk County, Arkansas.

Hot Springs who held a "Delzie Demaree Day" in commemoration of his 85th birthday on September 14, 1974. But as they said, "For those who may not be able to attend, Dr. Demaree's birthday is really the Fifteenth of September." Dr. Delzie Demaree is in many ways a remarkable man. Adverse to publish or perish and reticent to have his words subject to taxonomic quibblings, nevertheless he has provided future generations with a wealth of unequivocal scientific data sets—the herbarium sheet in all its glory. And for those curious curators who take time to examine the newspaper wrappings, they derive the added benefit of current events at the time and place of collection. Delzie has a penchant for using local papers for pressing specimens throughout his peripatetic range. Is this just another one of those idiosyncrasies, or is this the professor's way of saying,

"I thot I had better wise you up a little." (11-2-62)

—*Donald E. Stone, Department of Botany, Duke University, Durham, NC 27706.*

It is with great pleasure that we at Trailways join with you in extending Dr. Delzie Demaree our very best wishes.

During Dr. Demaree's long and illustrious career he has traveled extensively throughout the United States. We at Trailways feel fortunate to have carried Dr. Demaree more than 200,000 miles on a number of his fact and specimen finding excursions.

We trust that Dr. Demaree will continue traveling and enjoying the natural beauty of this country for many years to come. And we hope that when Dr. Demaree plans a trip we can continue to be of service to such a valued and respected individual.—*Harry J. Lesko, President—Trailways, Inc., 1500 Jackson Street, Dallas, Texas 75201.*

DR. DEMAREE AND THE PALMER *DRYOPTERIS*

W. CARL TAYLOR

Botany Section
Milwaukee Public Museum
Milwaukee, WI 53233

"This is the spot," Doc announced flatly as we crossed the low water bridge just outside Shirley, Arkansas. His statement was uncanny; how could he possibly know this to be the place. However, I had learned that Doc always seemed to know where he was because some time in the distant past he had been there before. We had come a long way to find this "spot." A puzzle of old letters, questions, and roads taken almost at random had brought us here on this hazy, humid afternoon of 18 August 1974. All the pieces did seem to fit: the river, the sandstone bluffs, the old railroad bridge, and even the old field just as Doc had described it. In the three summers I had spent with Doc traveling the state plant collecting, I had not observed him to be easily excited over just any plants. Doc lives to collect plants, but I guess after you have seen and collected so many it eventually gets hard to get excited over another one.

Compared to Doc I was but a novice plant collector, so I must admit that my heart began to beat faster as I climbed out of the van and put on my pack. Doc decided he would stay around the vehicle, I think because he wanted to see if I could find it on my own just as he had many years ago. I headed out across the old field to its far edge where a narrow strip of woods separated the field and sandstone bluffs above. I did this because Doc had told me that E. J. Palmer would often collect along the borders of fields and woods so that he could easily get specimens from two very different habitats. It was here, then, that I sought the notorious Palmer *Dryopteris*.

The Palmer *Dryopteris* was originally discovered by E. J. Palmer near Shirley, Arkansas on 30 March 1928. Shortly thereafter, pteridologists including J. K. Small, W. R. Maxon, and E. T. Wherry, who saw Palmer's specimens, theorized that this plant represented a new taxon. Doc visited the site on 4 November 1932 and collected several specimens. Three years later D. M. Moore found the same plant on 3 November 1935. After this date, no collections were made, and the exact location was lost. Several later attempts to relocate plants were unsuccessful.

It was a typical August day in Arkansas, and soon my clothes were saturated with perspiration and insects were buzzing about feasting on any exposed skin. After following the tree line to the river with no success, I cut up into the woods and stumbled about on a rocky talus, carefully searching every likely place. Still there was nothing unusual and actually few ferns

SIDA 9(4): 287–289. 1982.

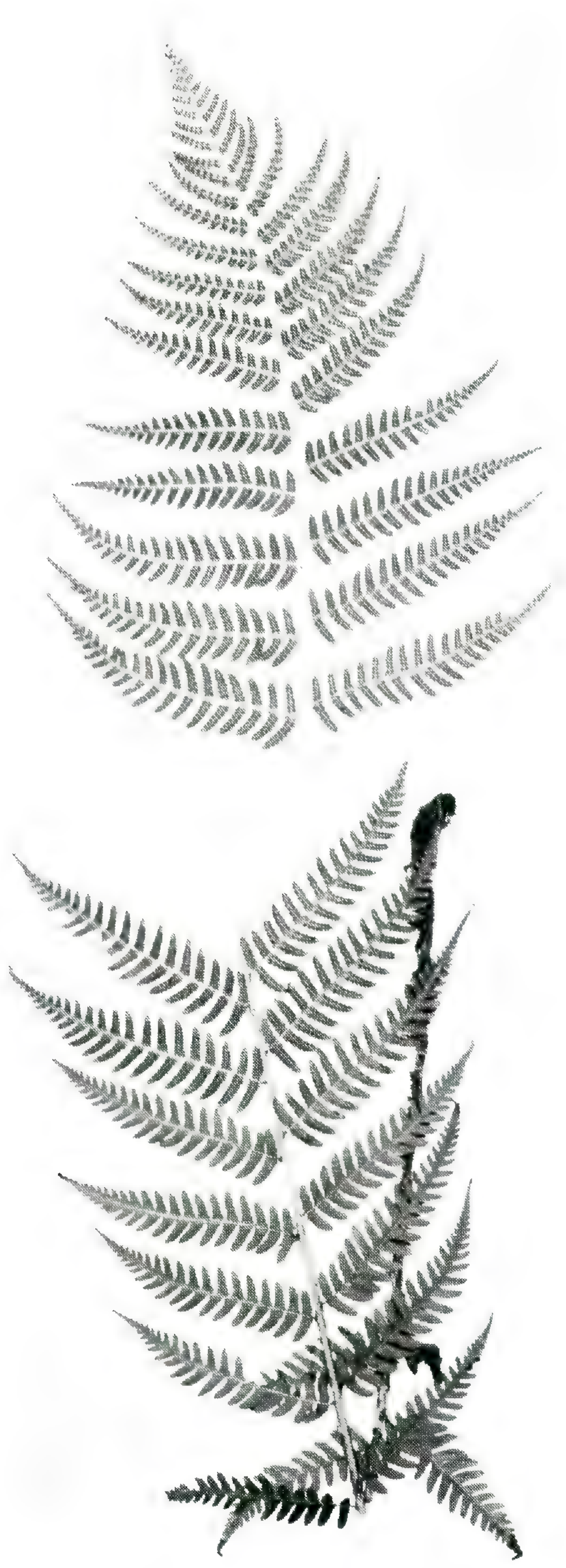

Fig. 1. Frond of the Palmer *Dryopteris* (*Dryopteris* X *leedsii* Wherry) collected on this date of its rediscovery in Arkansas 18 August 1974.

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of any sort were growing here. This lack of ferns in the area indicated that I was either in the wrong spot, or more likely, that the fern simply did not exist here anymore. After all, it had been nearly 40 years since it was last seen here. Besides, the area seemed too dry and too disturbed to harbor a rare fern. It would be better to spend time collecting in a more ferny place, so I decided to give up and return to the van. I thought it would be easiest to return through the narrow strip of woods rather than by way of the old field which was loaded with brambles.

As I moved along through the woods, I noticed that the understory opened up. The going was easier now, but I still had to watch my footing on the rocky slope. I glanced up for a second to notice a small sandstone outcrop above me and then my eyes glided downslope. Wow! What is that? There was something different in the understory not fifty feet away. A half-dozen excited strides confirmed my hope. The immense leaves of a fern the likes of which I had never seen before. As I got closer I could see that the gracefully arching fronds were over a meter in length. Quickly I looked on the underside of a fertile frond to view the sori. It was obviously a *Dryopteris* but the sori were located away from the margins of the pinnules, not along them as they are in the Marginal Woodfern, the only common *Dryopteris* of the Interior Highlands. Could it be the long-sought Palmer *Dryopteris*? It must be; what else could it be? I let out a loud whoop.

I collected several fronds and raced back to show Doc my discovery. I slowed to a walk as I approached Doc. I must not appear too excited or he might think less of my collecting ability. I casually passed the plastic bag containing the booty to him and, as calmly as I could, asked what he thought. He examined the fronds and their sori for a time, then turned and exclaimed, "Well, doggone that's it! Boy, you've got to write Wagner as soon as we get back to Hot Springs!" The gleam in his eyes, the grin on his face, and the way he handled the fronds told me that Doc was just as excited as I was. It was great to know that even after the many thousands of plants he had collected he could still be thrilled by just one.

We had rediscovered the Palmer *Dryopteris*! Doc had guided me to the right place as he had done so often. Thanks, Doc, for one of my most memorable days as a botanist. But, most of all, thanks for sharing with me and with so many others your wisdom and knowledge of field botany over the years. Your endless enthusiasm and dedication have been an inspiration to us all.

REFERENCE

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A NEW SPECIES OF *POLIOMINTHA* (LAMIACEAE) FROM THE CHIHUAHUAN DESERT REGION

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Irving recently published revisions of *Poliomintha* Gray (Irving, 1979) and the closely related *Hedeoma* (Irving, 1980). In both he discusses the close generic relationships of the two genera and with nine other genera of subtribe Melissinae. Within this complex, the new taxon best fits within the genus *Poliomintha* section *Saturejoides* Irving but has certain characters unique to this section and the genus.

POLIOMINTHA **maderensis** Henrickson sp. nov.

P. longiflora simulans sed pilis caulium firmis retrorsis (non antrosi-arcuatis), corollis lavandulaceis non aurantiaco-rubris; *P. glabrescens* accedens sed corollis longioribus, floribus solitaris axillaribus (non dichasio-cymosis); a *P. longiflora* et *P. glabrescens calycibus 1 mm sub orificiis annulatis pilis annuli rectis firmis, foliis juvenilibus dense strigosis pilis dendriticis caducis differt.*

Small shrubs 2.5 dm tall on exposed limestone rocky banks; stems slender, moderately branched, ascending-erect; young stems 4-angled, tan, purple at nodes, retrorsely strigulose with bent hairs 0.1–0.2 mm long, gland-dotted. Leaves opposite, with often purplish petioles 1 mm long; leaf-blades oblong-oblanceolate, 8–13(-18.5) mm long, 2.5–5 mm wide, acute to obtuse-rounded at tip, cuneate at base, primordial leaves densely vestitured with bent and irregularly forked-dendritic, white hairs 0.2–0.4 mm long, these soon glabrate, the cells whitish, thickish, hollow; mature leaves thickish, glabrate except for scattered antrorse appresed hairs along margins, with sessile glands 0.1 mm wide on both surfaces, green above, more glaucous beneath, midvein whitish beneath, lateral veins not apparent. Flowers solitary in upper leaf-axils, peduncles 1–2 mm long, pedicels 2 mm long, bracts linear-spathulate 2.5–4 mm long, 0.4 mm wide, leafy; calyx tubular 10–10.5 mm long, veins 13, obscure, tube 8.5–9.5 mm long, strigulose and gland-dotted as leaves, lobes 5, 2–2.5 mm long, lanceolate, acute, straight, closing together after corollas fall, sericeous inside with antrorse, white hairs 0.3 mm long, tube with distinct annulus of subsetose, straight hairs 0.8–1 mm long in ring 1 mm below tube orifice, otherwise glabrous inside, corolla purplish, 30–35 mm long, tube slender, ca 8 mm long, throat slightly ampliate; lips straight, ca 7 mm long; upper lip ovate, emarginate, 5 mm wide, lower lip 3-lobed, lobes rounded, lateral lobes somewhat divergent, outer corolla surface villous with hairs 0.7–1.5 mm long, villous inside for ca 4 mm in tube; fertile

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stamens 2, slightly exserted, adnate to mid throat, sterile stamens consisting of filaments ca 0.5 mm long; style 34 mm long, exserted. Fruit unknown. Fig. 1.

TYPE: MEXICO. COAHUILA: ca 36 (air) km WNW of Cuatro Cienegas along south-facing limestone crest of Sierra de la Madera, above Cayon de la Hacienda at margin of pine forest with *Stevia, Petrophytum, Nolina, Abelia, Quercus, Pinus*, and *Salvia*. Frequent shrub, fls. purple. Near 27°03′ N Lat., 102°24′ W Long. 2600 m. 27 Sep 1973. *J. Henrickson 13604*. (HOLOTYPE: LL; ISOTYPES: MEXU, TEX).

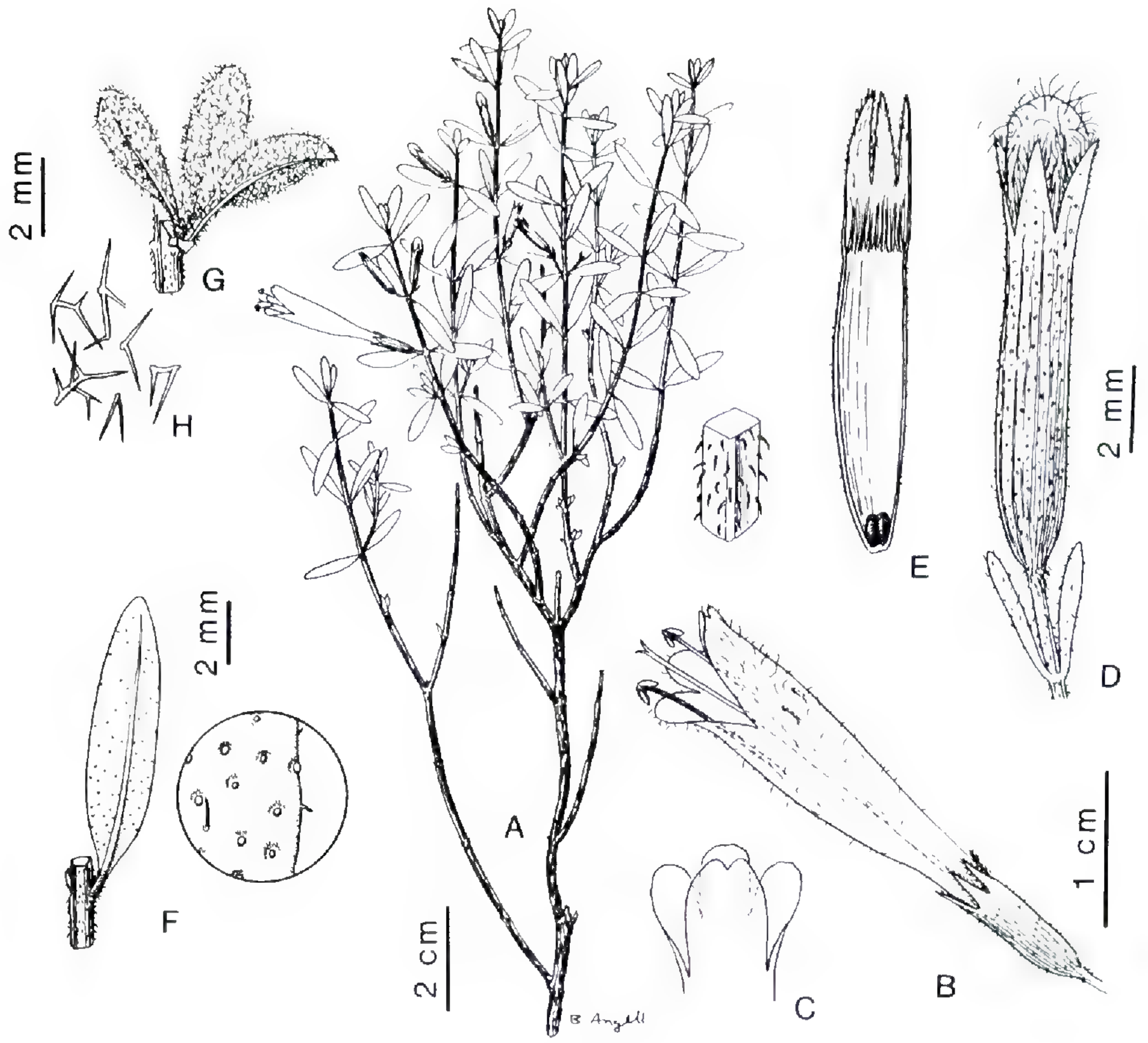

Fig. 1. *Poliomintha maderensis* Henrickson. A. Habit showing location of flowers. B. Flower showing exserted anterior anthers, and two posterior sterile stamens are represented by short filaments shown inside corolla. C. Top view of corolla tip showing emarginate posterior lip and 3-lobed anterior lip. D. mature bud showing emergent corolla, calyx and subtending bracts, pedicel. E. Longitudinal section of post-flowering calyx showing basal ovaries, interior annulus of subsetose hairs below lobes. F. Leaf with magnified area showing sessile glands, scattered trichomes. G. Developing leaves with dense vestiture of dendritically branched trichomes shown in H. All from *Henrickson 13604*, LL, TEX.

Additional collection: MEXICO. COAHUILA: Sierra de la Madera, summit Anteojo complex, w. of Cuatro Cienegas. 10 Aug 1970. *E. Meyer s.n.* (ASU).

The new species is most similar to *Poliomintha longiflora* Gray and *P. glabrescens* Gray of section *Saturejoides* for it shares with them a shrubby habit, glabrescent vestiture, elliptical leaf shape and long cinereous, 13-veined calyxes as well as broad lanceolate, tapering (not acuminate), erect calyx lobes that close over the calyx-orifice after the corolla falls. It differs from all species of the genus, however, in its well defined internal calyx-annulus of straight antrorse hairs in the upper tube below, not at, the calyx orifice and by the presence of coarse forked-dendritic to bent, soon deciduous hairs on the newly developing leaves. Similar hairs occur in developing leaves of *P. glabrescens* but they are simple, not forked or dendritic hairs. A well developed calyx annulus and dendritic hairs also occur in certain species of *Hedeoma* and *Hesperozygis*. At the species level the new species is similar to *P. longiflora* in its long corolla, mostly solitary flowers in each upper leaf axil, but differs in the more glabrescent leaves, and retrorse strigulose hairs on the stems (not curled, mostly antrorse hairs) and larger sessile glands 0.1 (not 0.06) mm wide, and purple (not orange-red) corollas. Stem- and leaf-vestiture and leaf-texture are more like those in *P. glabrescens*. However, this latter species has shorter, lavender corollas, flowers aggregated in simple to compound dichasial cymes of (1-)3–6(-13) flowers in each upper leaf axil.

The new species is known only from the exposed cliffs along the crest of the Sierra de la Madera above the pine-fir forest (Pinkava, 1979, 1981) associated with *Abelia coriacea, Comarostaphylis polifolia* ssp. *coahuilensis, Spiraea northcraftii, Echinocactus capricornis, Petrophytum caespitosum, Cercocarpus montanus* var. *paucidentatus, Pinus cembroides, Nolina cespitifera*, and *Quercus greggii. Poliomintha glabrescens* occurs at lower elevations in the same range. *Poliomintha longiflora* occurs much further to the south in an area near Saltillo, Coahuila and in central and northeastern Zacatecas.

ACKNOWLEDGEMENTS

I thank Marshall C. Johnson for the latin diagnosis, Bobbi Angell for the illustration, and The Plant Resources Center at The University of Texas for use of facilities.

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NEW SPECIES OF *CLITORIA* SUBGENUS *BRACTEARIA* SECTION *FLEXUOSAE* (FABACEAE) FROM PERU AND COLOMBIA[1]

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Members of *Clitoria* L. subgenus *Bractearia* (Mart. ex Benth.) Fantz section *Flexuosae* Fantz are characterized (Fantz, 1979) by their nodose, subpaniculate, zigzag inflorescences that bear large flowers (6–9.5 cm) having a densely pubescent calyx (typically sericeous), which is obscured by large, conspicuous bracteoles (8–41 mm long, 6–15 mm wide). Section *Flexuosae* is unique in the genus in that members produce zigzag inflorescences. The flexuous central axis of the inflorescence may be weakly developed in some individuals, but it usualy can be observed near the apex of the inflorescence. In other individuals, the flexuous inflorescence is developed strongly from the lowest flowering node upward. Section *Flexuosae* is also unique within the genus in that these species have a densely pubescent calyx in which the trichomes (1–2 mm long) are appressed and closely spaced (more or less silky in appearance), such that the surface of the calyx is obscured.

Members of section *Flexuosae* have been collected from refugia forests from Peru to southern Colombia at elevations of 250–600 m. Section *Flexuosae* comprises four species: *C. flexuosa* Fantz, *C. pozuzoensis* Macbride, and the two species described below. *Clitoria flexuosa* was originally described (Fantz, 1979) with a Latin diagnosis. A more complete description of this species and a description of a new variety are provided here.

1. CLITORIA **woytkowskii** Fantz, sp. nov.

Arbor ca 12 m altus, foliis trifoliolis, foliolis obovatis-ellipticis vel ellipticis, apice obtuso et acuminato abrupte, subra glabro, subtus nervis strigosibus; *petiolo et petioluto elongato. Inflorescentiae breves*, axe subpaniculati, infirme flexuoso. *Bracteae conspicui*, 7–10 mm longi, 4–7 mm lati. Bracteolae grandibus, elongati-oblongi, coriaceoi, longiora et occultanibus calyce, 41 mm longi, 13 mm lati. Calyce pubescentia confertis, trichomatibus brevibus, appressis, aspectibus sericeis aliquantum. Legumen ignotum.

Tree, ca 12 m tall. *Leaves* 3-foliate, coriaceous, concolorus, leaflets broad, elliptic to obovate-elliptic, apex broadly obtuse, abruptly acuminate, acumen 1–2 (2.5) cm long, 2–3 mm wide with expanded base of 6–10 mm width, base broad cuneate, midrib weakly raised on the upper surface with a shallow groove on each side, primary veins of 8–11 pairs, upper surface

[1] Paper no. 8462 of the Journal Series of the North Carolina Agricultural Research Service, Raleigh, N. C.

SIDA 9(4): 293–301. 1982.

glabrous, lower surface conspicuously strigose along veins, lamina (6) 10–18 cm long, 5–10 wide. Petiole quadrangular-terete, strigose, with one to three shallow longitudinal grooves, (5) 9–13 cm long, with a swollen base of 7–11 mm; rachis (1.5) 2.5–3 cm; petiolules 8–11 mm, sparsely pubescent. Stipules deciduous, deltoid, broadly acute, sparsely pubescent, 4–5 mm long, 1–2 mm wide; stipels narrowly deltoid, acute, 3–4 mm long, 0.6–0.9 mm wide. *Inflorescence* short, subpaniculate, axillary, several-flowered, pubescence of juvenile axes silky, densely strigose, becoming sparsely strigose to glabrate; peduncle 3–5 mm; central axis 1–2.5 cm, nodose, primary branches that bear the pedicels subsessile, 1–3 mm long; rachis internodes 1–2 mm, weakly zigzag; pedicels not observed. Bracts conspicuously broad, reflexed in age, multiveined, moderately densely strigulose, somewhat silky, ciliolate, ovate, acute, 7–10 mm long, 4–7 mm wide. Bracteoles very large, coriaceous, broad and elongate-oblong, apex rapidly tapering, acute, densely strigulose and somewhat silky, 41 mm long, 13 mm wide. Flowers white flushed with red veins (*teste* Woytkowski), fully mature flowers not observed (immature vexillum 5.5 cm protruding slightly beyond calyx, comparison with other species of equivalent state indicates mature flower ca 7–8 cm). Calyx densely strigulose, somewhat silky in appearance, multinerved, tube 26 mm long, 9 mm wide at base expanding to 10 mm at throat, lobes ovate, short-acuminate, 6 mm long, 4 mm wide, ventral lobe 8 mm x 1.5 mm, narrowly deltoid. Vexillum pubescence densely strigulose, silky, claw broad, cuneate, 7 mm long. Alae extended beyond the carina by ca 5 mm, blade 22 mm long, 6–11 mm wide, subfalcate, microuncinate pubescent, claw 14 mm. Carina falcate, acute, microuncinate pubescent, blade 16 mm long, 5–6 mm wide, claw 22 mm. Stamens diadelphous, free stamens coherent to near the middle; tube split near the base into two points of attachment, 35 mm long; free filaments 2–5 mm; anthers 3 mm long, 1 mm wide, connective apiculate. Gynophore 11 mm; ovary densely sericeous, trichomes white with yellowish tinge, 17 mm long, 1.8 mm wide; style conspicuously dilated near point of geniculation, similar to a "cobra hood", nearly 1.5 mm wide, 18 mm long, geniculate 8 mm from distal end; stigma capitate, 1 mm diam. *Legume* unknown. Fig. 1.

TYPE COLLECTION: PERU. SAN MARTIN: Tree 12 m high, flowers white, rose flushed with red veins, in the forest, alt. 500 m, Saposoa, 12 Apr 1962, *Woytkowski 7281* (HOLOTYPE: GH; ISOTYPE: US 2575475).

Both type specimens are deficient in some of the taxonomically critical structures. The Gray Herbarium specimen was selected as the holotype because it has both a dissected flower and mature leaves. However, no inflorescences are present. The Smithsonian specimen has smaller leaves and a few short inflorescence axes, but the flowers are lacking, having aborted. The short inflorescences and conspicuous bracts suggest segregation from the liana species of section *Flexuosae.*

Floral structures provide additional evidence. Some of the floral structures

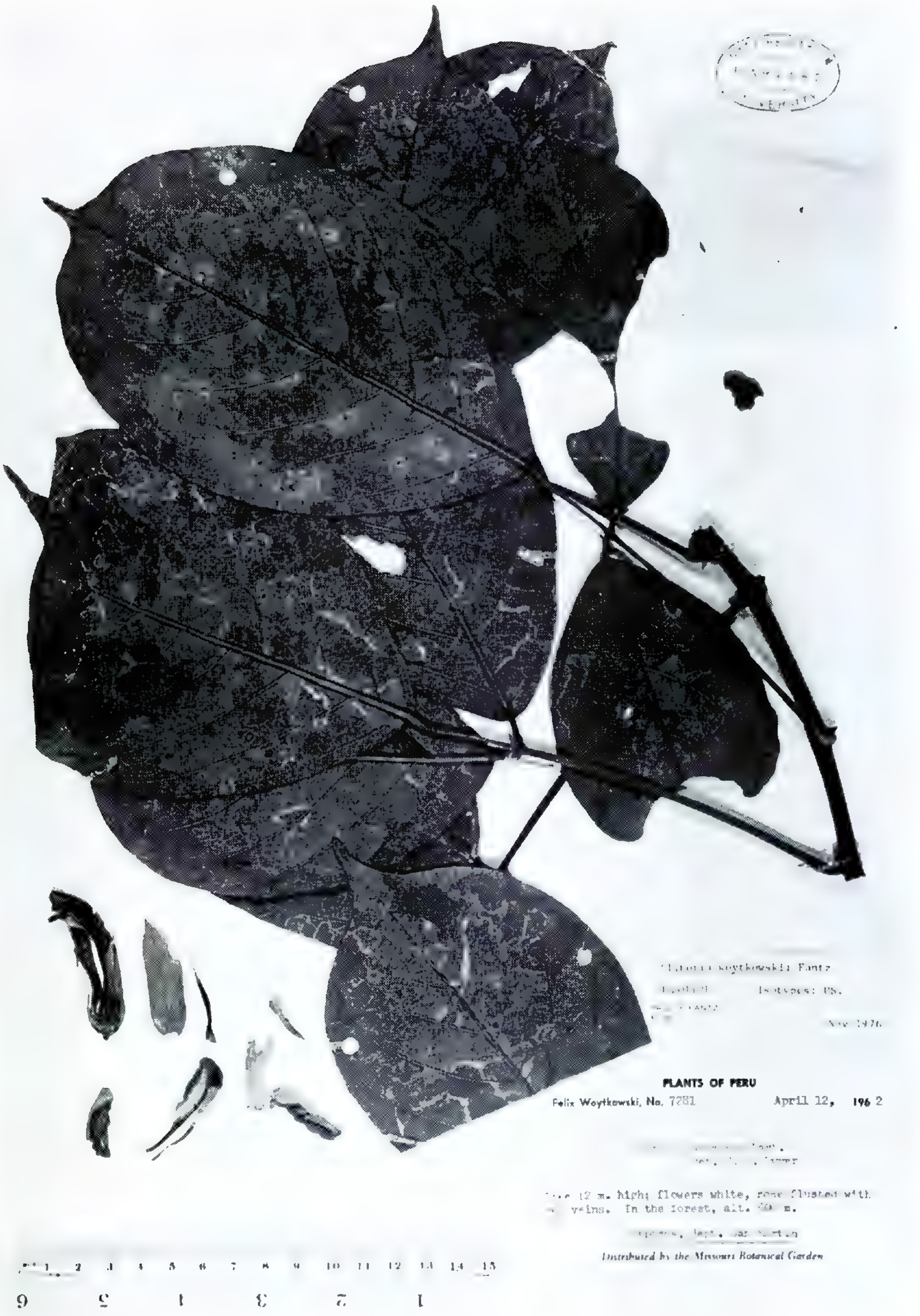

Fig. 1. Holotype of *Clitoria woytkowskii* (*Woytkowski 7281*, GH).

of *C. woytkowskii* do not represent the mature state. Comparison with flowers of similar stages in the other two commonly collected species (*C. flexuosa* and *C. pozuzoensis*) of section *Flexuosae* indicates that the calyx, bracteoles, bracts, androecium, and gynoecium represent mature structures. The anthers are well-developed. Accordingly, these measurements should be fairly reliable. The sizes of the petals, especially the alae and vexillum, are smaller than those of the mature flower. Therefore, their measurements are subject to modification with additional collections of this species.

This species is known only from the type location. Prance (1973) identified this area as the "East Peru Forest Refuge", one of sixteen pleistocene forest refuges in the Amazon Basin.

2. CLITORIA **magentea** Fantz, sp. nov.

Vites lignosi. Folia trifoliata, *foliolis* oblongis ad ellipticis-lanceolatis, *nervis primaris 14–18 parium. Inflorescentiae* 3–8 cm, flexuoso. *Bracteolae angusti, 5–7 mm latis*, 13–15 mm longis. *Flores parvi, magentei, 4–5 cm. Calyx tubo brevissimo, 13–15 mm.* Legumen ignotum.

Liana, tall climbing to the top of trees. *Leaves* 3-foliate, coriaceous, leaflets oblong to elliptic-lanceolate, nearly concolorous, apex acuminate, acumen 1–2.5 cm, bse broadly cuneate to rotund, primary veins of 14–18 pairs, upper surface glabrous, lower surface with scattered appressed hairs borne primarily on the major veins, lamina 8–16 cm long, (3) 5–8 cm wide. Petioles subsquadrangular-terete, a longitudinal groove present or absent, 4–10.5 cm long, scattered appressed trichomes; rachis 1.5–2.5 cm; petiolules subquadrangular, 6–9 mm. Stipules deciduous, ovate, sparsely strigose, ca 5 mm long, 3 mm wide; stipels 2–3 mm long, 1 mm wide. *Inflorescence* axillary and terminal, subpaniculate, several-flowered, flexuous, densely sericeous, 2–8 cm; pedicels 4–8 mm. Bracts ovate, acute, reflexed with age, 6–9 mm long, 4–5 mm wide, sericeous. Bracteoles oblong, apiculate, sericeous, 13–15 mm long, 5–7 mm wide, inserted 1 mm below the base of the calyx. Flowers small, 4–5 cm, magneta with red veins. Calyx pubescence silky, sericeous, tube obscured by the bracteoles, 13–15 mm long, 3–4 mm wide at the base expanding to 6–7 mm wide at the throat, lobes deltoid, 4–5 mm long, 3 mm wide, ventral lobe 5–6. Vexillum pubescence sericeous, blade 2.5 cm broad, claw 9–11 mm. Alae extended beyond the carina by 5–6 mm, blade 16–18 mm long, 4–6 mm wide, claw 9–10 mm. Carina falcate, blade 10 mm long, 3–4 mm wide, claw 15–18 mm. Stamens diadelphous, tube 28–31 mm long; free filaments 2–3 mm; anthers lanceolate, 2 mm long, 0.8 mm wide. Gynophore 5–6 mm, densely pubescent; ovary 9 mm long, 1–1.2 mm wide, densely pubescent, trichomes white tinged yellowish; style 20–21 mm, geniculate 8 mm from distil end, bearded; stigma capitate, 0.6–0.7 mm diam. *Legume* flat, coriaceous, long-stipitate, extended well beyond the calyx, pubescence moderately dense, trichomes to 1 mm long, appressed; stipe 32 mm; valves 14 cm long, 15–19 mm wide; dehiscence twisting 1/4–1/2 turns. Seeds black, compressed suborbicular faces, glabrous, 8–9 mm long, 8–10 mm wide, 2 mm thick; hilum oblong , 2 mm x 1 mm. Figure 2.

MISSOURI
BOTANICAL GARDEN
HERBARIUM

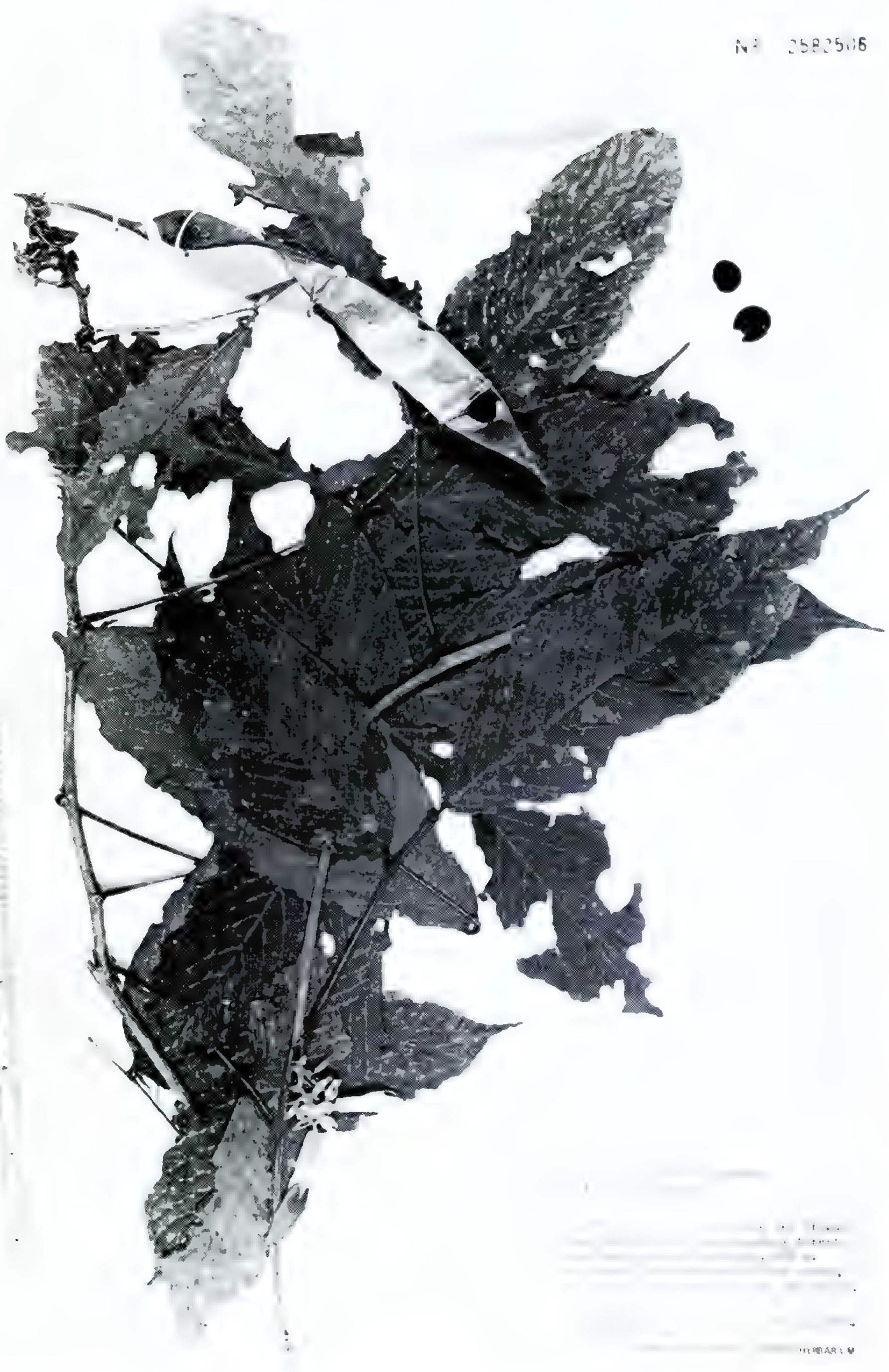

Fig. 2. Holotype of *Clitoria magentea* (*Davidse et al. 5719*, MO).

TYPE COLLECTIONS: COLOMBIA. CAQUETA: low secondary forest along small stream, 8 km SW of San Jose del Fragua (SW of Florencia), 300 m, 11 Jan 1974, *Davidse et al. 5719* (HOLOTYPE: MO 2582506; ISOTYPE: MO 2582534). COLOMBIA. PUTUMAYO: disturbed riverside, Río Putumayo opposite mouth Río Gueppi on border with Ecuador and Peru, 200 m, 19 May 1978, *Gentry et al 22114* (PARATYPE: FLAS 147532 & 147533).

The paratype contains dissected flowers and bears the label data "flowers magenta" upon which the specific epithet is based. The holotype bears flowers plus mature fruits and seeds, and accordingly is a more representative specimen for the reproductive structures.

Clitoria magentea is the only species of section *Flexuosae* known to bear both small, magenta flowers and leaflets with 14–18 pairs of major veins. By these characters, it can be distinguished quickly from its close relatives. The other species all produce large flowers (6–8 cm) that are white, the vexillum bearing pink to red veins. Leaflets of these species typically bear 8–13 pairs of major veins.

This species is known presently from the type locations only. Prance (1973) identified this area as the "Napo Forest Refuge," one of sixteen Pleistocene forest refuges in the Amazon Basin.

3. CLITORIA FLEXUOSA Fantz, SIDA 8(1): 93. 1979.

Liana. *Leaves* 3-foliate, coriaceous, leaflets elongate, elliptic-lanceolate to oblong-lanceolate, occasionally ovate-lanceolate to oblanceolate, nearly concolorous, apex acuminate, acumen 2–2.5 cm, base rotund, midrib deeply impressed above, seemingly in a groove, often bearing short, suberect hairs, primary veins of 8–11 pairs, upper surface glabrous, lower surface subpilose with spreading hairs along major veins or stiff, appressed hairs, becoming sparse to subglabrate, lamina 8–22 (27) cm long, 3–9 (12) cm wide. Petioles subquadrangular-terete, 4–10 cm; rachis 1–2 (3) cm; petiolules subquadrangular, 6–8 mm, microuncinate trichomes beneath spreading macrotrichomes. Stipules deltoid-lanceolate, acute, moderately dense, subappressed trichomes, 4–7 mm long, 2–3 mm wide; stipels linear, 3–6 mm long, 0.2–0.7 mm wide. *Inflorescence* axillary and terminal, solitary, subpaniculate, multiflowered, 2–10 cm; central axis densely pubescent, trichomes appressed, reddish-tinged, internodes conspicuously zigzag, bent alternatively in opposite directions at each successive node, 4–9 mm long; primary branches which bear the pedicels subsessile to 3 mm; pedicels 4–9 mm. Bracts conspicuous, ovate, more or less apiculate, concave, (6) 8–15 mm long, 6–9 mm wide, reflexed with age. Bracteoles very large, conspicuous, broad-oblong, obtuse to apiculate, subequaling the calyx to somewhat long, occasionally shorter to nearly half the calyx length (17–25 mm long in variety), typically 23–41 mm long, 9–15 mm wide. Flowers large, 6–8 cm, resupinate, white with veins of vexillum pink to dark red. Calyx pubescence silky, dense, appressed, tube 21–29 (32) mm long, 4–6 mm wide at the base expanding to 8–11

mm wide at the throat, lobes deltoid-ovate, nearly glabrous towards margins and apex, acute, 4–6 mm long, 3–4 mm wide, ventral lobe 6–7 mm. Vexillum pubescence silky, dense appressed, argenteous in bud becoming reddish-brown, blade 4–5 cm wide, claw 12–16 mm. Alae extended beyond carina by 7–8 mm, blade 23–30 mm long, 5–12 mm wide, broadened beyond carina apex, claw 21–26 mm. Carina falcate, 13–19 mm across, 4–7 mm wide, claw 33–38 mm. Stamens diadelphous, tube glabrous, split near the base into two points of attachment, 39–45 mm long; free filaments 2–6 mm; anthers large, 2.5–3 mm long, 0.7–0.9 mm wide. Gynophore elongate, 7–10 mm; ovary 17–18 mm long, 1.5–1.8 mm wide, densely pubescent, trichomes appressed, white tinged yellowish; style 18–26 mm long, bearded, geniculate 7–9 mm from distil end; stigma subcapitate, 0.8 mm diam. *Legume* flat, coriaceous, long-stipitate, extending beyond the calyx, pubescence scattered, trichomes appressed; stipe 33–39 mm; valves 16–17 cm long, 14–19 mm wide; dehiscence not observed. Seeds brown, compressed, faces suborbicular, smooth, ca 12 mm long, 10 mm wide, 4 mm thick, 6–7 seeds per pod; hilum oblong, 2 mm x 1 mm. Figure 3.

TYPE COLLECTIONS: PERU. SAN MARTIN: Tarapoto, Feb 1856, *Spruce 4527* (HOLOTYPE: K-Hb. Bentham; ISOTYPES: K-Hb. Hooker, W 18669). PERU. SAN MARTIN: Juan Jui, Alto Río Huallaga, ca 400 m, Sep 1934, *Klug 3820* (PARATYPES: BM, F 766344, GH, MO 1105520 & 1105521). PERU. SAN MARTIN: Tarapoto, *Spruce s.n.* (K).

Spruce 4527 was chosen as the type collection because the specimens have the typical flexuosus inflorescences bearing both flowers and fruit. Of the collections examined, only the holotypic specimen exhibits fruit. The specimen in the Hooker Herbarium at Kew has the very strongly zigzag inflorescence for which the species was named. *Spruce s.n.* was selected as a paratype since the specimen was from the type locality and in reality may be a duplicate in which only part of the data was transferred to the label. *Klug 3820* was also selected as a paratypic collection because of the strongly zigzag inflorescences and dissected flowers (GH), which added to the original description.

This species has close affinities with *C. pozuzoensis* Macbride which differs by bearing smaller bracteoles (1/4–1/3 the length of the calyx) and bracts (3–6 mm long), a shorter stripe (25–34 mm), a longer staminal tube (43–51 mm), and nearly glabrate leaves with inconspicuous, short, appressed hairs on the lower surface.

This species is known from departments San Martín and Loreto, Peru, within, and extending slightly west, of the area described by Prance (1973) as the "East Peru Forest Refuge". Specimens from each department exhibit different morphological characteristics and are treated as varieties.

3a. CLITORIA FLEXUOSA Fantz var. FLEXUOSA

Leaves pilose below, becoming glabrate, trichomes on major veins ascend-

Fig. 3. Holotype of *Clitoria flexuosa* (*Spruce 4527*, K-Hb. Bentham).

ing, spreading. Bracteoles elongate, subequal to longer than the calyx, occasionally slightly shorter (ca 0.9 x calyx), 23–40 mm long, 10–17 mm wide. Collected from San Martín, Peru.

3b. CLITORIA FLEXUOSA Fantz var. **brevibracteola** Fantz, var. nov.

Varietas novo *Clitoria flexuosa* distinguibili ad bracteolae calycem 2–4 plo brevior et angustior, et foliis subter glabrescentes.

Leaves minutely pubescent below (vidi 20X), trichomes short, appressed. Bracteoles shortened, one-half to three-quarters of the calyx length, 17–25 mm long, 8–10 mm wide. Collected from Loreto, Peru.

TYPE COLLECTION: PERU. LORETO: Forest clearing, Balsapuerto, 220 m, Jun 1933, *Klug 3105* (HOLOTYPE: G-Hb. Delessert, 2 sheets; ISOTYPES: A, BM, F 684787, GH, MO 1065939, S).

The Geneva specimen is mounted on two sheets within a common cover folder. It is the only specimen to exhibit fruit and a mature seed. The first sheet has a branch with leaves and a juvenile inflorescence. The second sheet has a fruit, a leaf, two flowers, one seed, and a pack with a fruit fragment.

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SORGHASTRUM (POACEAE) IN FLORIDA[1]

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ABSTRACT

Descriptions, habitats, ranges, frequencies, and flowering times of the four species of *Sorghastrum* indigenous to Florida are presented. Three-dimensional features of the inflorescences have proven critical in the discrimination of species. Past difficulties in identification are largely attributable to the two-dimensional aspects of the inflorescences seen in herbarium specimens. *Sorghastrum apalachicolense* D. W. Hall, endemic to Florida, is described from elevated spots in wet pine-wiregrass savannas.

Sorghastrum comprises thirteen to fifteen species in the warmer areas of the Americas and Africa. Four species are present in the United States and all four occur in Florida. One species, *S. nutans* (Linnaeus) Nash, is wide ranging East of the Rocky Mountains. The remaining three species are mainly confined to the southeastern United States.

In the field the four species are quite distinct. However, three of these, *S. elliottii* (Mohr) Nash, *S. nutans* (L.) Nash, and *S. secundum* (Elliott) Nash, have been very difficult to differentiate after being pressed as the distinctive aspects of the inflorescences are destroyed. Maturity of the inflorescences and the amount of dew or rain clinging to the spikelets also can alter the form. The fourth species, *S. apalachicolense*, has recently been discovered as an endemic in western Florida. The inflorescence of this newly found species is quite discrete being very open as compared to the compact nature of this in the other three species. Figure 1.

The key in Chase (1950) does not work for herbarium specimens of *S. elliottii* and *S. secundum* as the form of the panicle is usually destroyed in pressing, the color of the spikelets on both species varies from chestnut-brown to yellowish-brown, and the hairs on the ultimate branchlets of both species seem to be few and not conspicuously long-hairy toward the tip. The following descriptions expand on the data presented in the various floras of the United States (Allen, 1975; Chase, 1950; Correll and Johnson, 1970; Fernald, 1950; Gould, 1975; Hall, 1978; Long and Lakela, 1971; Radford, Ahles and Bell, 1968; Small, 1933) which deal with *Sorghastrum*. The key in this treatment should enable the identification of plants both in the field and herbarium. This treatment of the genus *Sorghastrum* is part of my dissertation, The Grasses of Florida (Hall, 1978), which is being revised for publication.

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FLORISTIC TREATMENT

Perennials; culms erect, tufted, sometimes rhizomatous, sheaths auricled; spikelets 2-flowered, paired–one sessile and perfect and the other pedicelled and rudimentary or the pedicel only present; sessile spikelets–glumes equal, leathery; first lemma sterile, 0- or 2-nerved; second lemma fertile, 1-2-nerved, 2-toothed, awned from tip; palea thin when present; pedicelled spikelets—rudimentary or absent; first lemma sterile, thin; second lemma sterile or staminate; terminal spikelets with 2 sterile pedicels; disarticulation at rachis joints, sessile spikelet, pedicel or pedicels, and inter-node attached.

The form of the panicles, as stated in the key and descriptions below, is distinctive for each of the species as observed on living plants in the field; however, this distinctiveness is seldom evident on herbarium specimens.

1. Awns to 1.3 cm long, once-geniculate; plants rhizomatous; surfaces of the glumes stramineous or only faintly brown basally ..... *S. nutans*
1. Awns 1.6–4.6 cm long, twice-geniculate; plants non-rhizomatous; surfaces of the glumes brown.
   2. Axis of the panicle straight and with the branchlets declining-second; spikelets 0.8–1.2 mm wide..... *S. secundum*
   2. Axis of the panicle notably arching, broadly bowed, branchlets distributed all the way around the axis *or* axis of the panicle straight and with the branchlets distributed no more than 180 degrees around the axis; spikelets 1.1–1.8 mm wide.
      3. Axis of the panicle notably arching, broadly bowed, the branchlets distributed all the way around the axis; spikelets 1.1–1.4 mm wide ..... *S. elliottii*
      3. Axis of the panicle straight and with the branchlets distributed no more than 180 degrees around the axis; spikelets 1.3–1.8 mm wide.. *S. apalachicolense*

SORGHASTRUM **apalachicolense** D. W. Hall, sp. nov. Open Indiangrass.

Perenni, culmis erectis, cespito, sine rhizomatibus; vaginis pubescentibus; laminis ad 7.3 mm latis et 43 cm longis, planis aut parum plicatis, glabris desuper, scabris infra; paniculis 23.6–32.5 mm longis et 4.7–10.5 cm latis (aristis inclusis), diffusis, *axibus rectis* et 0.7–1.3 mm latis ad locum 1–2 mm super nodum infimum, parce ramosis et cum paucis floribus, ramis longissimis 7.5–11.1 cm longis et patentibus; *spiculis 1.3–1.8 mm latis* et 5.2–7.2 mm longis, pubescentibus; aristis lemmatis 2.1–2.8 cm longis, tortis, flexis; pedicellis 4.0–5.4 cm longis.

Perennial; culms erect, caespitose, not rhizomatous; sheaths pubescent; blades to 7.3 mm wide and to 43 cm long, flat or slightly folded, glabrous above, scabrous below; panicles 23.6–32.5 cm long and 4.7–10.5 cm wide including awns, diffuse, axis straight and 0.7–1.3 mm wide at a point 1–2 mm above lowest node, sparingly branched and flowered, longest branches 7.5–11.1 cm long and spreading; spikelets 1.3–1.8 mm wide, 5.2–7.2 mm long, pubescent; lemma awns 2.1–2.8 cm long, twisted, bent; pedicels 4.0–5.4 mm long. Elevated spots in wet savannas and longleaf pine-wiregrass ridges. Calhoun to Franklin County. Locally common. July-August.

This species was discovered by Robert K. Godfrey. As presently known it occurs on both sides of the Apalachicola River including parts of Liberty,

Franklin, and Calhoun Counties. Dry elevated sites, usually dominated by longleaf pine and wiregrass, are typical where this endemic may be found. Even slight rises of just a few inches above wet areas afford enough elevation for the plant to establish itself.

The branches of the inflorescence on one side curve around the axis 180°. This leaves one side of the inflorescence axis bare. When wet with dew or rain the branchlets and spikelets droop to one side on the axis, often causing it to arch downwards.

Sorghastrum apalachicolense blooms and fruits in July and August. No other *Sorghastrums* flower and fruit at this time, at least in West Florida. Fruits and often the stems of *Sorghastrum apalachiocolense* will have fallen before other species of this genus start flowering.

TYPE: UNITED STATES. FLORIDA. Liberty Co.: longleaf pine-wiregrass sand ridge, at the jct of FL 12 and FL 379, between Sumatra and Bristol, 5 Aug 1978, *R. K. Godfrey 76630* (HOLOTYPE: FLAS; ISOTYPES to be distributed to BH, BM, FSU, GH, ISC, MO, NCU, NY, TAES, US, USF).

Other specimens examined: FLORIDA. Calhoun Co.: well drained longleaf pineland, S of Blountstown, by FL 71, 2.2 m S of jct with FL 275, *Godfrey 76642* (FSU); well drained longleaf pineland, S of Blountstown, by FL 71, 3/4 mi S of jct with FL 73, *Godfrey 76643* (FSU); well drained longleaf pineland, by FL 73, 8 mi N of Kinard and S of Carksville, *Godfrey 76644* (FSU); pine flatwoods, 2.2 mi S of jct with FL 275 on FL 71, *Hall 514* (FLAS); dry pine flatwoods, 3/4 mi S of jct with FL 73 on FL 71, *Hall 515* (FLAS); dry ridge, 8.1 mi N of Kinard on FL 73, *Hall 517* (FLAS). Franklin Co.: longleaf pine-wiregrass sand ridge, vicinity of Wright Lake, SW of Sumatra, *Godfrey 76635* (FLAS, FSU). Liberty Co.: elevated place in wet pine savanna, about 4 mil NW of Sumatra, by FL 379, *Godfrey 76620* (FLAS, FSU); Longleaf pine-wiregrass ridge, 7 mi S of jct of FL 12 and FL 379 by FL 379, between Sumatra and Bristol, *Godfrey 76631* (FLAS, FSU); Longleaf pine-wiregrass sand ridge, 12.1 mi S of jct of FL 12 and FL 379 by FL 379, between Sumatra and Bristol, *Godfrey 76633* (FLAS, FSU).

SORGHASTRUM ELLIOTTII (Mohr) Nash, N. Amer. Fl. 17: 130. 1912. Slender Indiangrass.

Chrysopogon elliottii Mohr, Bull. Torrey Bot. Club 24: 21. 1897.

Perennial; culms erect to ascending, not rhizomatous, i.e. caespitose; sheaths glabrous or pubescent; blades to 9.0 mm wide and to 58 cm long, flat to folded, scabrous and rarely pubescent above, scabrous below; panicles 19.8–34.6 cm long and 3.6–6.4 cm wide including awns, diffuse, axis arching, broadly "U" or bow-shaped and 0.3–0.8 mm wide at a point 1–2 mm above lowest node, sparingly branched and flowered, longest branches to 4.5 cm long and erect to appressed; spikelets 1.1–1.4 mm wide, 5-2–6.2 mm long, pubescent; lemma awns 2.1–3.4 cm long, twisted, bent; pedicels 3.3–5.3 mm long. Old fields, barrens and mixed woodlands, usually upland pine or pine-oak communities often over a clay subsoil. Counties adjacent to Georgia,

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Fig. 1. Inflorescences of *Sorghastrum*. 1. *S. secundum* X 1/3. 2. *S. elliottii* X 1/2. 3. *S. nutans* X 1/3. 4. *S. Apalachicolense* X 1/3.

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Apalachicola River E to Hamilton County in Florida. Infrequent. September-November. General: E Maryland, Virginia, Tennessee, Arkansas, Oklahoma, SE Coastal Plain from North Carolina to E Texas.

This species receives its common name from its distinctive habit. The culm is notably thin in relation to the other species and has a distinctive bow-shape to the inflorescence.

Normally Slender Indiangrass is found in areas where the vegetation is quite open.

Representative specimens: FLORIDA. Hamilton Co.: sandy, open woods, banks of Suwanee River, above Ellaville, *Godfrey 53957* (FSU). Leon Co.: old field near Tallahassee, *Baggs & Henry s.n.* (FLAS); Clay banks at edge of semi-open pine-hardwood, along Orchard Pond Road, *Godfrey 68949* (FSU). Jefferson Co.: upland, open pine-oak woodland, ca 2 mi N of Wacissa, *Godfrey 56216* (FSU, USF). Liberty Co.: moist borders of mixed woodland, on slope, Torreya State Park, *Godfrey 65015* (FSU). GEORGIA: Clarke Co.: field border on hilltop, agronomy farm, Whitehall, *Domby 30* (FLAS); woods across from Biological Science Building, University of Georgia, *Banks 1399* (USF). LOUISIANA: Quachita Parish: 12 mi SW West Monroe, frequent clumps on sandy clay loam of oak-pine forested hills, *Kral 8013* (FSU). St. Helena Parish: longleaf pine forest ca 4 mi NE of Greensburg, *Allen 9752* (FLAS). NORTH CAROLINA: Alexander Co.: dry open woods, 2 mi NW of Vashti, *Radford 45149* (FLAS). Martin Co.: sandy woods, Conoho Creek, 4.5 mi NW of Williamston, *Radford 45281* (USF). SOUTH CAROLINA: McCormick Co.: pine-oak-hickory woods, 5 mi SW of McCormick, *Duncan 10394* (FLAS). TENNESSEE: Knox Co.: open woods on bluffs along Tennessee River, 4 mi SW of Knoxville, *Iltis 1622* (FLAS, FSU). TEXAS: Smith Co.: marginal thickets of pastures and open woods, Amigo, *Moore 1041* (FLAS).

SORGHASTRUM NUTANS (L.) Nash, in Small, Fl. Southeast. U.S. 66. 1903.
Yellow Indiangrass.

Andropogon nutans Linnaeus, Sp. Pl. 1045. 1853.

Perennial; culms erect, rhizomatous; sheaths glabrous or pubescent; blades to 11.4 mm wide and to 54 mm long, flat to folded, glabrous above and below; panicles 11.4–36.3 cm long and 2.3–4.3 cm wide, axis straight and somewhat stiffly erect, axis 0.7–2.1 mm wide at a point 1–2 mm above the lowest node, densely branched and flowered with longest branches to 8.8 cm long and erect to appressed; spikelets 1.1–1.4 mm wide, 4.6–7.1 mm long, pubescent lemma awns 6.2–12.4 mm long, twisted, bent; pedicels 2.3–4.1 mm long. Sand pine scrub, sandy oak woods, pine woods, barrens, roadsides and fields. Hillsborough County in the central peninsula northwards and through the panhandle. Infrequent, but locally common. September-November. General: East of the Rocky Mountains; Southern Canada, United States, Northern Mexico.

Yellow Indiangrass is the only North American Sorghastrum with rhizomes. The awns are shorter and once-geniculate versus twice-geniculate when compared with the other species of North America.

Representative specimens: ALABAMA: Mobile Co.: wet flatwoods 10.7 mi S of Theodore on AL 59, *Kral 29729* (FLAS). ARKANSAS: Drew Co.: fallow bottoms, Monticello, *Demaree 25511* (FSU). FLORIDA: Alachua Co.: roadside near Gulf Distributor tanks in Gainesville, *Arnold s.n.* (FLAS). Hamilton Co.: sandy loam along R.R., near FL 41, 4.1 mi SE of Genoa, *Perdue 1826* (FSU, USF). Hernando Co.: shallow fresh water pools about 2 mi E of Weekiwachee Springs, *Ray 9523* (FLAS, FSU, USF). Hillsborough Co.: sandhill, Temple Terrace, 46th St. about 3/4 mi S of University of South Florida, Tampa, *Lakela 32549* (USF). Leon Co.: estate 12 mi W of Tallahassee, *Ritchey s.n.* (FLAS). Madison Co.: longleaf pine, turkey oak sand ridge, 9 mi E of Greenville, *Godfrey 53987* (FSU). Okalossa Co.: sandy oak woods, *Hume s.n.* (FLAS). Pasco Co.: about 2 mi S of Wilson Haven off US 41, *Ray 10318* (USF). Putnam Co.: moist soil SW end of airport at Welaka, *Laessle s.n.* (FLAS). Walton Co.: along Laird Drive, 4 mi S of Freeport, *Davis 15269* (FLAS). GEORGIA: Oglethorpe Co.: shaded edge of woods, Echols Mill, about 9.3 mi N of Lexington, *Montgomery 269* (FLAS). Upson Co.: open oak woods on summit of Pine Mt., W of Thomaston, *Cronquist 4708* (FLAS). IOWA: Fremont Co.: on top of steep loess bluff near West Mt. Olive Church, Washington Township, *Morrill 1344* (FSU). KANSAS: Riley Co.: dark moist soil along KS 177, 8 mi S of Kansas State Univ. in Manhattan, Konza Prairie Research Natural Area, *Kooijman 319* (FSU). MISSISSIPPI: Harrison Co.: pine open forests above Bay Saint Louis, Henderson Point, *Demaree 36230* (USF). SOUTH CAROLINA: Bamberg Co.: sandy upland woods, NW of Govan, *Ahles 37624* (FLAS). McCormick Co.: pine-oak-hickory woods, 6 mi SW of McCormick, *Duncan 10396* (FLAS). TENNESSEE: Polk Co.: edge of Sphagnum bog 3-4 mi E of Ducktown, TN 60, *Rogers 31405* (USF). TEXAS: Dallas Co.: Stults Prairie, SW corner of Coit Road and Line Road, *Correll 22582* (FSU).

SORGHASTRUM SECUNDUM (Elliott) Nash, in Small, Fl. Southeast. U.S. 67. 1903. Lopsided Indiangrass.

Andropogon secundus Elliott, Bot. S.C. and Ga. 1: 580. 1891.

Perennial; culms erect to ascending, not rhizomatous, i.e. caespitose; sheaths glabrous or pubescent; blades to 8.1 mm wide and to 42 cm long, flat to folded, scabrous above and below; panicles 14.8–47.4 cm long and 3.6–6.7 cm wide including awns, 1-sided, axis straight and 0.5–1.4 mm wide at a point 1–2 mm above lowest node, moderately to densely branched and flowered with longest branches to 7.5 cm long and spreading to appressed along one side; spikelets 0.8–1.2 mm wide; 5.3–7.4 mm long, pubescent; lemma awns 1.65–4.3 cm long, twisted, bent; pedicels 3.5–6.3 mm long. Turkey oak-longleaf pine woods, scrub oak sand ridges, flatwoods, mixed woodlands, hammocks, savannas, beaches, roadsides and rocky pinelands. Throughout Florida. Common. July-November. General: SW South Carolina, Georgia, Florida, Alabama, Mississippi.

Mostly occuring in thinly wooded areas, the one-sided inflorescence renders this species visible from some distance. The straight inflorescence axis with the spikelets all positioned to one side is especially distinctive.

In South Florida the species begins blooming in July while from Central Florida northwards flowering does not start till September.

Representative specimens: ALABAMA: Escambia Co.: longleaf-pine, Hill Forest Experimental Forest, S of Brewton and W of AL 93, *Ford 5204* (FLAS). FLORIDA: Alachua Co.: rich, dry, sandy soil, Devil's Millhopper, Gainesville, *Weatherwax s.n.* (FLAS). Bay Co.: pine flatwoods, 10 mi E of Panama City, *Ford 5316* (FLAS). Broward Co.: 5 mi W of Cocoa, slash pine-saw palmetto flatwoods, *Kral 5270* (FSU). Charlotte Co.: flatwoods, *Frye s.n.* (FLAS). Collier Co.: pineland, N of schoolhouse, Marco Island, *Lakela 31188* (USF). Dade Co.: dry, rocky pineland 6 mi W of Naranja, *Sargent 6644* (FLAS). Duval Co.: pine barrens near Jacksonville, *Curtiss 6252* (FLAS). Escambia Co.: longleaf pine-scrub oak ridge, Warrington, *Godfrey 74558* (FSU). Flagler Co.: ditch in pine flatwoods along S side of FL 100, 3.4 mi W of Bunnell, *Hansen 6671* (USF). Glades Co.: Serenoa prairie E of Nash, Palmdale, *Davis s.n.* (FLAS). Hernando Co.: grassy roadside along US 41, 4 mi N of Brooksville, *Ray 9487* (USF). Hillsborough Co.: Tampa, *Garber s.n.* (FLAS). Levy Co.: across from section 16, S side of highway, Bronson, *Swallen s.n.* (FLAS). Liberty Co.: longleaf pine-scrub oak ridge, FL 12, 2 mi NW of junction with FL 65, *Godfrey 76668* (FLAS). Monroe Co.: rocky pinelands, Big Pine Key, *Brass 28982* (FLAS). St. Johns Co.: moist soil, N side Hastings, *Ward 2304* (FLAS). Walton Co.: Longleaf pine-scrub oak, junction of FL 217 and FL 219, *Tyson 442* (USF). GEORGIA: Chatham Co.: sandy roadside, 7 mi W on GA 204, *Swank 327* (USF). Long Co.: open pine-palmetto area, 5 mi SW of Ludowice, *Duncan 7869* (FLAS). Richmond Co.: sandhills, Augusta, *Cuthbert s.n.* (FLAS). MISSISSIPPI: Lamar Co.: 15.5 mi W of Hattiesburg, near Little Black Creek, *Jones 2460* (FSU). SOUTH CAROLINA: Beaufort Co.: dry woodland, St. Helena Island, *Cuthbert s.n.* (FLAS). Jasper Co.: Tillman Ridge, 7.4 mi NW of Tillman on County Route 119, *Leonard 2764* (FLAS).

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DISTRIBUTIONAL AND NOMENCLATURAL NOTES ON THE FLORA OF THE TEXAS COASTAL BEND

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The Texas coastal bend region has been narrowly defined by Jones (1977) as that area within a radius of 30–60 miles of Corpus Christi. Included in this region are portions of the vegetation areas of Texas (Gould, 1962) known as the Gulf Prairies and Marshes, the South Texas Plains, and outliers of the Post Oak Savannah. Because the region as defined by Jones includes these three diverse floral provinces, the vegetation is likewise very diverse in this small area. Habitats include the coastal salt marshes and dunes, prairies, river bottoms, semi-xeric limestone (caliche) hills, fresh ponds and marshes, and disturbed sites. Jones (1977) has provided an interesting account of floristic changes since settlement by Europeans.

Floristically, the region is interesting in that it is geologically recent and its diversity is due to migration and establishment of species from the south, west, and north. Within the area are populations that originated in warmer climates to the south and reached their northern range limits here, as well as species that have migrated from the east Texas forests and reach their southwestern limits. There are also species that have reached the area from the Edwards Plateau to the west, but most of the taxa have arrived from the prairies from the north due to the similar edaphic factors of the coastal prairies. Since the region is heavily utilized for ranching, agriculture, and minerals, the extensive disturbance that has resulted has allowed invader species or 'weeds' to become well-established. Probably the most remarkable feature of the flora of the region is its similarity to that of the Paraná basin of South America. Dozens of species are disjuncts from that region, and the most reasonable explanation is that of seed transport by birds since the area is on the west branch of the Mississippi flyway from South America. This relationship of the floras has been reviewed by Hill (1982). Chance species introductions by birds from the Caribbean seems also to have occurred as evidence by the presence of *Hibiscus cubensis* A. Rich., a Cuban species known from a single large bayou in Calhoun County near the coast.

Jones (1977) has treated the vascular flora of the region with the exception of the grasses which were treated by Gould and Box (1965) and later in the treatment of Texas grasses by Gould (1975). A supplement to Jones' book was presented by Hill (1981) who included plants from areas slightly

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to the north and east of Jones' *Flora* as well. This area will be included in Jones' newest edition of the *Flora* to be published soon (Jones, pers. comm.). A total of 96 new records were added to the region bringing the total to 1417 (Jones, 1977, p. xxi). This paper adds 32 more taxa to the list as well as presenting distributional notes intended to be of assistance to anyone working in this region. Acronyms for herbaria where specimens are deposited follow the format in Hill (1981); all of the vouchers were collected by the author.

CUPRESSACEAE: JUNIPERUS VIRGINIANA L. is not indigenous to this region, but has become established at old house sites where it remains scarce and does not seem to be spreading. Refugio Co.: ridge S of Sous Creek, E side of Rte. 77 ca 6 mi S of Woodsboro, *8526* (oc, rk).

POACEAE: ALOPECURUS CAROLINIANUS Walt. was included in Gould & Box (1965) but no specimens had been seen. It is actually occasional to frequent in shortgrass areas particularly near harvester ant nests. Refugio Co.: Greta Ranch, SE side Rte. 77, 8 mi NE of Refugio, *8251* (gol, MARY, NY, oc, rk, TAES, vic, VT); pasture, E side FM 2678 near Rte. 774, Refugio, *4655* (CHAPA); San Patricio Co.: 1.5 mi E of St. Paul, *4677* (CHAPA, gol. oc. vic).

AXONOPUS AFFINIS Chase was also included in Gould & Box (1965) but without a definite record for the region. The species is wide-ranging and is also known in the Paraná basin of South America. In our region it is local on sandy ridges and terraces near creeks and prairie lakes. Refugio Co.: W terrace of St. Nicholas Lake, Greta Ranch, ca. 8 mi NE of Refugio, *6045* (gol, oc, vic); sand ridge at S side Willow Lake, Greta Ranch, *10546* (gol, MARY, MO, oc, TAES, vic, VT).

BRIZA MINOR L. is an introduced European species very scarce in our region. It was not included in Gould & Box (1965) but was reported from eastern Gulf prairies by Gould (1975). Refugio Co.: disturbed pasture, W side FM 2678 3.8 mi N of Mission River, Refugio, *5113* (oc).

BROMUS SECALINUS L. is another Old World introduction not reported by Gould & Box (1965), but reported from the eastern Gulf prairies by Gould (1975). It is very scarce in our area. Goliad Co.: roadside, Rte. 183/77A near Little Sarco Creek crossing, *8629* (gol, MARY, MO, NY, oc, rk, TAES, vic, VT).

DIGITARIA VILLOSA (Walt.) Pers was not reported by Gould & Box (1965) but was reported for the Gulf prairies by Gould (1975). It has been considered a variety of *D. filiformis* by some authors. Victoria Co.: sandy terrace S of Coleto Creek, 2 mi W of Rte. 77, *6360* (oc, vic).

ECHINOCHLOA WALTERI (Pursh) Heller was included in Gould & Box (1965) but no definite records were known. It was reported for the eastern Gulf prairies by Gould (1975). In our region it is scarce and restricted to

river banks. Goliad Co.: banks of San Antonio River ca 7 mi SE of Goliad, River Ranch, *6266* (gol, oc, vic).

ERAGROSTIS HIRSUTA (Michx.) Nees is a post-oak savannah species not reported by Gould & Box (1965) nor for our area by Gould (1975). Goliad Co.: sandy pasture at mission ruins, Rte. 59 near San Antonio River crossing, *5499* (oc, TAES).

ERAGROSTIS TRICHODES (Nutt) Wood. is another post-oak savannah species that also occurs in the south Texas plains and pine woods, but was not reported by Gould & Box (1965) nor Gould (1975) for our region. Goliad Co.: McNamara Ranch road near power line just W of Rte. 239, ca 2.8 mi SW of Goliad, *6471* (gol, oc, vic); Refugio Co.: Rooke Ranch, sandy terrace at Recinda bend of Aransas River, *7820* (gol, oc, rk, vic, VT).

MELICA NITENS (Scribn.) Nutt. is an Edwards Plateau disjunct not recorded for our region by Gould & Box (1965) nor Gould (1975). It is scarce at one locality. Refugio Co.: shaded bottomland along Medio Creek, East Rogers Pasture 4 mi N of Woodsboro, *6911* (MARY, rk, TAES).

PANICUM TENERUM Beyr. is very scarce in Texas, and was not reported from our region by Gould & Box (1965). Gould (1975) reported the species from Hardin Co. only. The present record (det. verified by Gould) is a significant disjunction. Refugio Co.: disturbed pasture 3.8 mi N of Mission River at W side of FM 2678, *5115* (oc, TAES, vic).

PHALARIS ANGUSTA Nees ex Trin. is another species with a disjunct population in the Paraná basin of South America. Gould & Box (1965) did not report the species for our region but Gould (1975) reported it from the Gulf prairies under the epithet '*angustata*'. It is occasional in swales. Victoria Co.: Coleto Creek area along Fleming Prairie Rd 1.9 mi SW of Rte. 77, *8289* (gol, MARY, MO, oc, rk, vic, VT).

SETARIA GLAUCA (L.) Beauv. is an Old World plant not included in Gould & Box (1965) but said to be occasional throughout except in the south Texas plains by Gould (1975). Refugio Co.: weed in sorghum field, N side Aransas River, Rooke Ranch, *7154* (oc, rk, vic).

SPOROBOLUS VAGINAEFLORUS (Torr. ex Gray) Wood. was not included in Gould & Box (1965) nor listed for our region by Gould (1975). It is locally frequent in disturbed sandy clays. Goliad Co.: McNamara Ranch road near Rte. 239, ca 2.8 mi SW of Goliad, *6315* (gol, MARY, oc, TAES, vic, VT); Refugio Co.: East Rogers pasture N side Kelly Rd 4 mi N of Woodsboro, *8038* (CHAPA, CTES, gol, LG, MARY, NY, oc, OSU, rk, TAES, vic).
CYPERACEAE: BULBOSTYLIS CILIATIFOLIA (Ell.) Fern var. COARCTATA (Ell.) Kral has been reported for our region (Kral, 1971; p. 215).

BULBOSTYLIS JUNCOIDES (Vahl) Kükenth. var. AMPLICEPS Kükenth. Kral (1971, map p. 213) showed a record of this variety probably in Kleberg Co. but a reference to the site was lacking in the text and in Correll & Johnston

(1970). If it truly occurs in our area it would be a significant disjunction from west Texas.

FIMBRISTYLIS DECIPIENS Kral was reported from the Matagorda/Jackson Co. area where it is a rice field weed introduced from Louisiana (Kral, 1971; p. 219). It should be expected in our region since rice cultivation is increasing, particularly in Victoria County.

FIMBRISTYLIS MILIACEA (L.) Vahl has also been reported as a rice field weed in the Matagorda/Jackson Co. area (Kral, 1971; p. 217) and is to be expected in the coastal bend.

FUIRENA BREVISETA (Coville) Coville, according to Kral (1978), is known from the coastal bend, particularly San Patricio and Nueces Co.

FUIRENA LONGA Chapm. has been reported from our region in Aransas Co. (Kral, 1978).

FUIRENA PUMILA (Torr.) Spreng. has been reported from the Aransas/Refugio Co. area, (Kral, 1978).

COMMELINACEAE: COMMELINA ERECTA var. ERECTA is less frequent than var. *angustifolia*, but is also present in disturbed sandy oils. Refugio Co.: sand terrace between McGuill Lake and Mission River S of Refugio, *6396* (oc); N side Aransas River, Rooke Ranch near headquarters, *7298* (rk); junction of Medio and Blanco Creeks ca 4.5 mi N of Woodsboro, *7762* (rk); San Patricio Co.: S terrace of Aransas River ca 5 mi E of St. Paul, O'Connor Ranch, *6344* (gol, vic).

CANNACEAE: CANNA ORCHIOIDES Bailey is similar to the frequently escaped and persistant *C. indica* reported by Jones (1977) but differs in its yellow and orange, not red, flowers. It persists at old house sites. Refugio Co.: Greta Ranch, Jones Pasture, Rte. 77 ca 8 mi NE of Refugio, *10677* (gol, NY, oc, TAES, vic, VT).

URTICACEAE: BOEHMERIA NIVEA (L.) Gaud. is introduced but often appears native. Victoria Co.: Coleto Creek bottoms 2 mi W of Rte. 77, *6368* (gol, oc, vic).

ROSACEAE: PRUNUS ANGUSTIFOLIA Marsh. The Chickasaw plum is introduced in our region, but may be established in some areas. Goliad Co.: River Ranch headquarters, ca 7 mi SE of Goliad E of Rte. 239, *6593* (gol, oc, vic).

FABACEAE: AMORPHA FRUTICOSA L. is locally common at this one locality in our region. Refugio Co.: banks of Guadalupe River at Rte. 35 NE of Tivoli, *10556* (GH, gol, MO, NY, oc, TAES, vic, VT).

EUPHORBIACEAE: CAPERONIA PALUSTRIS (L.) St.-Hil. is a rice field weed whose spread was documented by Correll & Johnston (1970) who reported it from Harris, Jefferson, and Matagorda Co. This report is a significant disjunction to the west. Refugio Co.: disturbed pasture in oil field, House Pasture, Greta Ranch, E side Rte. 77 ca 8 mi NE of Refugio, *10682* (GH, gol, MARY, MO, NY, oc, TAES, vic, VT).

MALVACEAE: GOSSYPIUM HIRSUTUM L., cotton, is a well-known crop in

our region that should be added to our flora as an occasional waif along roads and edges of old fields. Refugio Co.: cultivated at Rooke Ranch, Woodsboro, *7394* (oc, rk).

APOCYNACEAE: CATHARANTHUS ROSEUS (L.) D. Don. The Madagascar periwinkle, a common garden ornamental, persists occasionally at old house sites. Refugio Co.: Jones Pasture, Greta Ranch, E side Rte. 77 ca 8 mi of Refugio, *10675* (MARY).

LAMIACEAE: HEDEOMA REVERCHONII Gray var. SERPYLLIFOLIUM (Small) Irving, once considered a variety of *H. drummondii*, has been reported for our area by Irving (1980).

ASTERACEAE: BIDENS BIPINNATA L., while widespread in the SE U.S. was considered infrequent in Texas (Correll & Johnson, 1970). This record is the first report for the genus in our region. Refugio Co.: near old house site, Jones Pasture, Greta Ranch, E side Rte. 77 ca 8 mi NE of Refugio, *10671* (GH, gol, MO, NY, oc, TAES, vic, VT).

ADDITIONAL NOTES

The information here concerns aspects of the distribution and nomenclature of taxa already included for the region by Jones (1977, noted simply as 'Jones' in this portion of the text) and also by Correll and Johnston (1970, noted as 'C&J' in this portion of the text). Since most of the vouchers are held in private ranch herbaria (see Hill, 1981) they are cited to make this information more readily available to the botanical community. Eleven of the taxa included are Texas endemics scarce both in our region and in the state in general. Unless otherwise noted, the following are new county records for the coastal bend.

Two habitats in particular have provided significant numbers of new records. The first of these includes several creek terraces with deep sands in Goliad and Refugio Co. that appear to hold vestiges of a former interior dune flora. Twenty-three of the species discussed here are inland dunes 'disjuncts'. Another group of 22 species reach their eastern limits of range on the caliche hills near the San Antonio River in Goliad Co., a habitat most unusual so far east.

EQUISETACEAE: EQUISETUM HIEMALE var. AFFINE (Engelm.) A. A. Eaton is also local along the Mission River in Refugio Co. ca 2 mi S of Refugio, *6412* (gol, oc, vic, VT) and upstream at Medio Creek ca 4.5 mi N of Woodsboro, *7197* (rk).

MARSILEACEAE: MARSILEA MEXICANA A. Br. was previously known in Texas only from Aransas Co. (Jones, C&J). It also occurs in Refugio Co.: prairie ponds S of Willow Lake, Greta Ranch, ca 8 mi NE of Refugio, *10504* (GH, gol, MARY, MO, NY, oc, TAES, vic, VT).

ALISMATACEAE: ECHINODORUS PARVULUS Engelm. is occasionally found inland at the sandy margin of prairie lakes in Refugio Co.: 1.8 mi N of Woodsboro, Barn Pasture, Rooke Ranch, *7753* (gol. oc, rk, vic).

POACEAE: WILLKOMMIA TEXANA Hitchc. is a rare grass found in the Texas coastal bend and again in the Paraná basin of northern Argentina. Gould (1975) reported it from Kleberg and San Patricio Co. It also is locally common in shortgrass alkaline prairies in Refugio Co.: W side FM 2678 1.5 mi N of Mission River crossing, *6230* (oc); Greta Ranch, 1.5 mi S of Willow Lake ca 8 mi NE of Refugio, *10500* (GH, gol, MARY, MO, NY, oc, TAES, vic, VT).

CYPERACEAE: CAREX PLANOSTACHYS Kunze is also in Goliad Co.: caliche hill 1.8 mi SW of San Antonio River, Rte. 59, *4617* (gol, oc, vic); and in Refugio Co.: bushy slope, East Rogers pasture, Rooke Ranch ca 4 mi N of Woodsboro, *6914* (rk, VT).

CYPERUS OXYLEPIS Nees ex Steud. was reported as infrequent in Aransas and San Patricio cos. by Jones and was also reported from Karnes, Nueces, and Refugio Co. by C&J. It has become more frequent on brackish flats due to salty oil field effluent. Refugio Co.: Packery Flats, Mission River at FM 2678, *5932* (oc, vic); margin of salt pond in oil field, East Rogers pasture, Rooke Ranch, 4 mi N of Woodsboro, *8058* (rk); salty effluent, Greta oil field, SE side Rte. 77, 8.1 mi NE of Refugio, *10475* (GH, gol, NY, oc, TAES, vic, VT).

FUIRENA SIMPLEX Vahl was reported from Aransas Co. and Padre Island by Jones. It also occurs inland in Goliad Co.: near Martinez Creek, just NW of McNamara ranchhouse, 2.8 mi SW of Goliad, *5564* (gol, oc, vic); Hwy 183/77A 0.8 mi N of Little Sarco Creek, *6080* (oc, vic); and Refugio Co.: North Clarkson Pasture, Rooke Ranch, ca 2.5 mi NNW of Woodsboro, *7047* (rk).

RHYNCHOSPORA CADUCA Ell. occurs not only on the Aransas Refuge as reported by Jones but also in Refugio Co.: small marsh near Melon Creek, Red Well Pasture ca 2.5 mi SW of Willow Lake, Greta Ranch, *10592* (gol, MARY, NY, oc, TAES, vic, VT).

RHYNCHOSPORA MICROCARPA Baldw. ex Gray was reported as rare, from Aransas Co. only, by C&J. It also occurs inland in Refugio Co.: marsh near Melon Creek, 1 mi S of Hwy 774, Refugio, *5967* (gol, oc, vic).

LEMNACEAE: WOLFFIELLA LINGULATA (Hegelm.) Hegelm. was said to be reported from Texas by C&J and was cited from the Welder Refuge by Jones. It also occurs in Refugio Co.: oxbow lake, Lake Trap, Rooke Ranch, N of Aransas River, 7.5 mi SSW of Woodsboro, *8531* (gol, MARY, NY, oc, rk, vic, VT).

JUNCACEAE: JUNCUS ACUMINATUS Michx. is much more widespread in our region than suggested by Jones. It also occurs in Goliad Co.: FM 2441 at Sarco Creek, *5151* (gol, oc, vic), Bisset Ranch, Arroyocita Pasture, *6139* (MARY, VT); Refugio Co.: near Melon Creek 1 mi S of Rte. 774, *4589* (oc, vic); Greta Ranch, Rte. 77, 8.5 mi NE of Refugio, *4858* (gol, oc, vic); FM 2441 ca 3 mi NW of Woodsboro, *6741* (rk, VT), River Pasture, N side of Aransas River 7.5 mi SSW of Woodsboro, *6852* (TAES); and

Victoria Co.: near Coleto Creek 2 mi SW of Rte. 77, *8327* (MARY).

JUNCUS INTERIOR Wieg. was recorded for Goliad and San Patricio Co. by Jones but is also abundant in our region in Refugio Co.: Greta Ranch, Rte. 77 8.5 mi NE of Refugio, *4838* (oc, vic); 3.8 mi N of Mission River crossing along FM 2678, *5131* (oc); N side of Aransas River 1 mi E of Rte. 77, *6653* (rk, VT).

JUNCUS VALIDUS Cov. is less frequent than the two species above, and is also found inland in Goliad Co.: Rte. 183/77A 0.8 mi NW of Little Sarco Creek crossing, *6081* (TAES, vic); and Refugio Co.: near Melon Creek 1 mi S of Rte. 774, *5650* (oc, vic); Mission River flats at FM 2678, *5921* (gol, VT); 1.8 mi N of FM 2441, 1 mi W of Rte. 77, Woodsboro, *7219* (rk).

LILIACEAE: ALLIUM ELMENDORFII M. Ownbey is a Texas endemic reported by C&J from Bexar, Wilson, and Atacosa Co. and by Jones from Nueces and San Patricio Co. It also occurs in Refugio Co.: N side of Aransas River 0.4 mi SE of Rte. 77 crossing, *6608* (rk).

ALLIUM RUNYONII M. Ownbey is another South Texas endemic reported by C&J and Jones as extending north to Kleberg Co. The new records appear to represent its northern limit, in Goliad Co.: intersection of FM 2441 and Sarco Creek ca 8 mi S of Goliad, *8597* (oc, vic); and Refugio Co.: NW side Rte. 77 8.2 mi NE of Refugio, *8397* (gol, MARY, MO, NY, oc, TAES, vic, VT).

AMARYLLIDACEAE: HABRANTHUS TEXANUS (Herb.) Steud. = *H. tubispathus* (L'Her.) Traub. Holmes and Wells (1980) have presented evidence that our plant is the same as the South American Paraná basin disjunct. This is still another example of the remarkable affinity of these floras.

FAGACEAE: QUERCUS MACROCARPA Michx. is also found in Victoria Co.: along Coleto Creek 2 mi SW of Rte. 77, *6364* (oc, vic).

POLYGONACEAE: ERIOGONUM LONGIFOLIUM Nutt. is more widespread than indicated by Jones, and is also found in Goliad Co.: Clip-McNamara Ranch road ca 3 mi SW of Goliad, *5527* (gol, oc, vic); FM 2441 1.8 mi S of Rte. 183/77A, *5721* (oc); and Refugio Co.: North Clarkson Pasture, NE side of FM 2441 4.5 mi NW of Woodsboro, *7256* (VT).

RUMEX HASTATULUS Baldw. ex Ell. is widespread in Refugio and San Patricio Co., and is also found in Goliad Co.: FM 2441 at Sarco Creek, *4764* (oc, vic); River Ranch, Rte. 239 7 mi SE of Goliad, *4910* (oc, vic); and Victoria Co.: sand terrace S of Coleto Creek 2 mi SW of Rte. 77, *8322* (gol, rk).

RUMEX SPIRALIS Small is a South Texas endemic with its northern limit in Refugio Co.: banks of Mission River at FM 2678, *4942* (oc, vic); brackish marsh, FM 1360 1.3 mi SSE of Woodsboro, *6702* (rk); East Rogers Pasture, margin of Medio and Blanco Creeks ca 4 mi N of Woodsboro, *6756* (rk, vic).

AMARANTHACEAE: FROELICHIA GRACILIS (Hook.) Moq. was reported

from Kleberg and Jim Wells Co. by Jones, and is also found as a field weed in Refugio Co.: sorghum field between FM 2678 and Melon Creek ca 1.5 mi N of Mission River, *5982* (gol, oc, vic).

NYCTAGINACEAE: MIRABILIS LINEARIS (Pursh) Heimerl. also occurs in Refugio Co.: N terrace of Aransas River ca 2 mi NW of Rte. 77 crossing, *6090* (VT); North Clarkson Pasture, NE side FM 2441 4.5 mi NW of Woodsboro, *7253* (TAES); East Rogers Pasture 4 mi N of Woodsboro near the Mission River, *8045* (MARY, rk, VT).

AIZOACEAE: GLINUS RADIATUS (R. & P.) Rohrb. is also found in Refugio Co.: South Cranell Pasture, Rooke Ranch, 6 mi S of Woodsboro, *7171* (gol, oc, rk, vic).

PORTULACACEAE: TALINUM PARVIFLORUM Nutt. is also found in Refugio Co.: shortgrass prairie, Greta Ranch, ca 8 mi NE of Refugio, *5410* (oc, vic); N bank of Aransas River ca 2 mi W of Rte. 77 crossing, *6089* (gol, vic).

NYMPHAEACEAE: NELUMBO PENTAPETALA (Walt.) Fern. is occasional not only in Refugio Co. but also in oxbow lakes of the San Antonio River in Goliad Co. (unvouchered).

NYMPHAEA MEXICANA Zucc. is also found in Refugio Co.: McGuill Lake 1 mi W of FM 2678 ca 4.3 mi S of Rte. 774, *5335* (gol, oc, pf, vic); oxbow lake near ranchhouse, Rooke Ranch, N side of Aransas River 7 mi S of Woodsboro, *7519* (rk, TAES).

RANUNCULACEAE: ANEMONE CAROLINIANA Walt. also occurs in Refugio Co.: N terrace of Aransas River ca 8.5 mi SSW of Woodsboro, Rooke Ranch, *6507* (rk, VT).

BRASSICACEAE: DRABA CUNEIFOLIA Torr. & Gray also occurs in Goliad Co.: caliche hill 1.8 mi SW of San Antonio River, Rte. 59, *4616* (oc); 0.6 mi N of Little Sarco Creek along Rte. 183/77A, *6582* (vic); and Refugio Co.: sandy hill, N terrace of Aransas River ca 8.5 mi SSW of Woodsboro, Rooke Ranch, *6505* (rk).

LESQUERELLA GRANDIFLORA (Hook.) Wats. is a Texas endemic which seems to reach its northern limit in our area, known also from Goliad Co.: W side Rte. 183/77A 0.6 mi N of Little Sarco Creek crossing, *6586* (oc); and Victoria Co.: sandy terrace S of Coleto Creek 2 mi SW of Rte. 77, *8339* (gol, MARY, NY, oc, rk, vic, VT).

RORIPPA ISLANDICA (Oeder) Borbas was said to be found only at Lake Corpus Christi by Jones. It is also found in Goliad Co.: San Antonio River banks, River Ranch, ca 7.5 mi SE of Goliad, *6109* (VT); and Refugio Co.: pond edge, SE corner of Barn Pasture, Rooke Ranch, 1.8 mi N of Woodsboro, *7752* (rk).

DROSERACEAE: DROSERA ANNUA E. L. Reed is also known from Goliad Co.: sandy terrace of Sarco Creek, FM 2441 8.5 mi S of Goliad, *8586* (gol, MARY, NY, oc, TAES, vic, VT).

SAXIFRAGACEAE: LEPUROPETALON SPATHULATUM (Muhl.) Ell. is also

occasional in Goliad Co.: W side Rte. 183/77A 0.6 mi N of Little Sarco Creek, *6585* (gol, vic); and Refugio Co.: 0.5 mi E of FM 2678, 0.5 mi S of Rte. 774, *4588* (oc); Aransas River terrace 1 mi E of Rte. 77, 8.5 mi SW of Woodsboro, *8219* (rk).

ROSACEAE: PRUNUS TEXANA Dietr. This Texas endemic is also found in Goliad Co.: Cadena Creek terrace at Rte. 239, *5867* (oc); and Refugio Co.: 1.5 mi N of FM 2441 ca 3.5 mi NW of Woodsboro, *6737* (rk); near Melon Creek, Red Well Pasture, ca 7 mi NE of Refugio, *10591* (NY, TAES, VT).

LEGUMINOSAE: ACACIA HIRTA T. & G. is the generally accepted name for *A. angustissima* var. *hirta* (T. & G.) Robins.

CAESALPINIA DRUMMONDII (T. & G.) Fisher is a rare species of Gulf Coastal Texas and adjacent Mexico previously known in Texas from Atascosa, Bee, Goliad, Karnes, and San Patricio Co. (C&J, Jones). It also occurs in brushland in Refugio Co.: N side of Aransas River, O'Connor Ranch, ca 9 mi WSW of Woodsboro, *6085* (gol, oc, vic); N side of Aransas River 1 mi E of Rte. 77 crossing, *6661* (rk); 2 mi S of Woodsboro, E side Rte. 77, *6917* (rk).

CALLIANDRA CONFERTA Gray is also found in Goliad Co.: caliche hills along Rte. 59 ca 2.1 mi SW of San Antonio River, *5905* (gol, oc, vic).

CASSIA BAUHINIOIDES Gray, while rare, is found at its eastern range limit in Goliad Co.: caliche hills along Rte. 59 2.1 mi SW of San Antonio River, *5896* (oc).

CASSIA OCCIDENTALIS L. is also found inland in Refugio Co.: pasture weed, Rooke Ranch, 0.5 mi W of Rte. 77 1.8 mi N of Woodsboro, *8065* (gol, oc, rk, vic, VT).

COURSETIA AXILLARIS Coult. & Rose is a rare species known previously in Texas only from Duval, Hidalgo, Jim Hogg, and San Patricio Co. It also occurs in a small population at its northeastern limit of range in Refugio Co.: South Tallow pasture, Rooke Ranch, slope at N side of Aransas River at power lines, 6.6 mi S of Woodsboro, *7629* (gol, oc, rk, vic).

DALEA AUREA Nutt. was said to occur in Bee and Jim Wells Co. by Jones. It also occurs in Goliad Co.: caliche hill along Rte. 59 2.1 mi SW of San Antonio River, *5739* (oc, vic); Refugio Co.: N bank of Aransas River at Recinda Bend, ca 8.5 mi SW of Woodsboro, *7286* (rk); and San Patricio Co.: Aransas River terrace ca 5.5 mi NE of St. Paul, *5785* (gol).

DESMANTHUS ILLINOENSIS (Michx.) MacM. also occurs at one locality in Refugio Co.: along shell road, Rte. 35 1.7 mi N of Tivoli, *10552* (GH, gol, MARY, MO, NY, oc, TAES, vic, VT).

GALACTIA HETEROPHYLLA Gray is a Texas endemic that reaches its eastern limit of range in Goliad Co.: caliche hills N of Rte. 59 2.1 mi SW of San Antonio River, *8619* (gol, MARY, oc, vic, VT).

LATHYRUS PUSILLUS Ell. is a rather generally distributed, but infrequent species also occurring in Refugio Co.: Greta Ranch, Rte. 77 ca 8.5 mi NE

of Refugio, *4884* (gol); Packery Flats along the Mission River at FM 2678, *4943* (oc, vic); and in Victoria Co.: near Fleming Prairie Road 1.9 mi SW of Rte. 77 near Coleto Creek, *8293* (gol, oc, rk, vic).

MEDICAGO LUPULINA L. is a more frequent and generally distributed introduced species than indicated by Jones. It also occurs in Goliad Co.: caliche hill along Rte. 59 1.2 mi NE of FM 1351, *5051* (gol, oc, vic); FM 2441 at Sarco Creek crossing, *5142* (gol, oc, vic); and Refugio Co.: N side of Aransas River near Rte. 77, *7081* (MARY, rk); 0.4 mi W of Rte. 77, 1.8 mi N of FM 2441, *8552* (rk).

MEDICAGO ORBICULARIS (L.) Bartal. also persists from cultivation but is much less frequent than the last. It also occurs in Refugio Co.: 0.5 mi S of Woodsboro at E side of Rte 77, *6690* (rk).

PETALOSTEMON MICROPHYLLUM (T. & G.) Heller also occurs in Refugio Co.: N terrace of Aransas River at Rte. 77, *7681* (gol, oc, rk, vic).

PITHECELLOBIUM FLEXICAULE (Benth.) Coult., according to C&J, ranges as far north as Sinton, San Patricio Co. Apparently, its northern limit is actually in Refugio Co.: caliche slope in Lake Trap, Rooke Ranch, ca 7.5 mi SSW of Woodsboro, *6828* (rk).

SESBANIA VESICARIA (Jacq.) Ell. is locally frequent in other portions of Refugio Co. besides those listed in Jones, and is also in Goliad Co.: Clip Ranch road near Melo Ranch, ca 3 mi SW of Goliad, *6184* (oc).

STROPHOSTYLES LEIOSPERMA (T. & G.) Piper is also found inland in Goliad Co.: River Ranch near San Antonio River ca 7 mi SE of Goliad, Rte. 239, *6094* (gol, oc, vic); prairie 1 mi N of Little Sarco Creek, W side of Rte. 183/77A, *6440* (TAES); and Refugio Co.: Greta Ranch, sandy prairie ca 2 mi N of Hwy 77 and 8.5 mi NE of Refugio, *10539* (MARY).

STYLOSANTHES VISCOSA Sw. is also found inland in Goliad Co.: Rte. 239 at Cadena Creek, *5582* (oc); W side of Rte. 183/77A 0.8 mi N of Little Sarco Creek crossing, *6074* (gol, oc, vic); and Refugio Co.: North Clarkson Pasture, Rooke Ranch, E side FM 2441, 4.4 mi NW of Woodsboro, *7863* (gol, rk, TAES, vic, VT).

TEPHROSIA ONOBRYCHOIDES Nutt. is also found inland in Refugio Co.: Greta Ranch, ca 8.5 mi NE of Refugio along Rte. 77, *5404* (gol, oc, vic).

GERANIACEAE: An obvious difference, not yet noted in any published key, between *Geranium carolinianum* and *G. texense* is that the former has 10 stamens and the latter has 5.

MALPIGHIACEAE: ASPICARPA HYSSOPIFOLIA Gray apparently reaches its eastern limit in Goliad Co.: caliche hills at N side of Hwy 59, 2.1 mi SW of San Antonio River, *5744* (pf, VT).

THRYALLIS ANGUSTIFOLIA (Benth.) O. Ktze. also reaches its eastern limit in Goliad Co.: caliche hills at N side of Rte. 59, 2.1 mi SW of San Antonio River, *5462* (ENCB, gol, oc, vic); and in Refugio Co.: caliche hill, Lake Trap, Rooke Ranch ca 7.5 mi SSW of Woodsboro, *7353* (gol, oc, vic).

RUTACEAE: THAMNOSMA TEXANA (Torr.) Gray also occurs in Goliad

Co.: caliche hills near McNamara ranchhouse, 2.8 mi SW of Goliad, *5562* (gol, oc, vic); caliche hils at N side of Rte. 59 2.5 mi SW of San Antonio River, *6490* (gol, oc, vic).

POLYGALACEAE: POLYGALA ALBA Nutt. is frequent in the eastern portion of our range as well, not only in Refugio Co., but also in Goliad Co.: McNamara ranch road near FM 2441, 2.8 mi SW of Goliad, *5061* (BM, gol, oc, vic); caliche hills at N side of Rte. 59 2.5 mi SW of San Antonio River, *5475* (NO).

POLYGALA GLANDULOSA HBK. apparently reaches its northeastern limit in Goliad Co.: caliche hills at N side of Rte. 59, 2.5 mi SW of San Antonio River, *5737* (oc, vic).

POLYGALA INCARNATA L. is also found inland in Goliad Co.: sandy post oak woods 0.6 mi W of FM 2441, Goliad, *5522* (gol, oc, vic); and in San Patricio Co.: Aransas River terrace, ca 5.5 mi NE of St. Paul, *5801* (oc).

POLYGALA VERTICILLATA L. is also found in Goliad Co.: Rte. 183/77A near Little Sarco Creek crossing, *5543* (NY, pf); and in Refugio Co.: Greta Ranch, N of Rte. 77 ca 8.5 mi NE of Refugio, *5398* (gol, oc, vic).

EUPHORBIACEAE: ACALYPHA OSTRYIFOLIA Ridd. is also found as a weed in Goliad Co.: Clip Ranch, 7.3 mi SW of intersection of FM 2441 and Rte. 183/77A, *5809* (gol, oc, vic).

BERNARDIA MYRICIIFOLIA (Scheele) Wats. reaches its eastern limit of range in Goliad Co.: caliche hills N of Rte. 59 2.5 mi SW of San Antonio River, *5059* (TAES, VT).

CROTON ARGYRANTHEMUS Michx. is also found inland in Goliad Co.: FM 2441 6.5 mi S of Rte. 183/77A near Sarco Creek, *5159* (gol, VT); FM 2441, 1.8 mi S of Rte. 183/77A, *5710* (oc, vic).

EUPHORBIA CORDIFOLIA Ell. is also found inland on sands in Goliad Co.: bank of Little Sarco Creek at Rte. 183/77a, *5541* (gol, oc, vic); FM 2441 near Sarco Creek, *6424* (gol, oc, vic); and in Refugio Co.: N terrace of Aransas River just E of Rte. 77, *7684* (BM, rk, TAES, VT).

EUPHORBIA COROLLATA L., reported only for Refugio Co. by Jones, is also rarely found in Goliad Co.: ranch road 0.7 mi NE of McNamara ranchhouse, 2.8 mi SW of Goliad, post oak area, *6310* (oc).

JATROPHA CATHARTICA Teran. & Berl. apparently reaches its northern range limit in Refugio Co.: rare in scrub pasture, FM 2678 3.8 mi N of the Mission River crossing, *5673* (oc).

TRAGIA RAMOSA Torr. is also found in Goliad Co.: caliche hills N of Rte. 59, 2.5 mi SW of San Antonio River crossing, *5014* (gol).

AQUIFOLIACEAE: ILEX VOMITORIA Ait. is also frequent inland in oak mottes in the E portion of the coastal bend, particularly in Refugio Co.

SAPINDACEAE: UNGNADIA SPECIOSA Endl. is also present along the San Antonio River in Goliad Co.: Rte. 59 crossing, *8192* (gol, MARY, NY oc, TAES, vic, VT).

MALVACEAE: In my recent supplement (Hill, 1981) I neglected to indi-

cate the name change for *Abutilon lignosum* (Cav.) D. Don to *A. berlandieri* Wats. for our plants. Also, a printing error was made in the name *Sida abutifolia* Miller (= *S. filicaulis* Torr. & Gray).

HYPERICACEAE: ASCYRUM HYPERICOIDES L. is also found inland in sandy oak mottes in Refugio Co.: Greta Ranch, Rte. 77 ca 8.1 mi NE of Refugio, *6042* (oc, vic); Rte. 77, 1.8 mi N of FM 2441, Woodsboro, *8002* (oc, rk, vic).

HYPERICUM DRUMMONDII (Grev. & Hook.) Torr. & Gray is also in Goliad Co.: Rte. 183/77A 0.8 mi N of Little Sarco Creek crossing, *6069* (gol, oc, vic); Rte. 59 0.7 mi SW of San Antonio River crossing, *6460b* (vic); and in Refugio Co.: Aransas River terrace 1 mi E of Rte. 77, *7724* (gol, rk, VT).

HYPERICUM GENTIANOIDES (L.) BSP. is also rarely found inland in sandy post oak woodlands in Goliad Co.: Bisset Ranch ca 4 mi W of Goliad between FM 2441 and Clip Ranch road, *6136* (oc, vic).

CISTACEAE: HELIANTHEMUM ROSMARINIFOLIUM Pursh was reported by Jones from San Patricio Co. only. It also occurs in Refugio Co.: Greta Ranch N of Rte. 77, 8.1 mi NE of Refugio, *5399* (oc); S side of Sous Creek, ca 6 mi S of Woodsboro, *8517* (gol, MARY, NY, oc, rk, TAES, vic, VT).

VIOLACEAE: VIOLA MISSOURIENSIS Greene is also found in Refugio Co. at the headwaters of the Mission River at Medio and Blanco Creeks ca 4.7 mi N of Woodsboro, *6552* (rk).

PASSIFLORACEAE: PASSIFLORA INCARNATA L. is locally frequent as well in live oak mottes in Refugio Co. at the Greta Ranch, N side of Rte. 77 8.1 mi NE of Refugio, *10685* (GH, gol, MARY, MO, NY, oc, TAES, vic, VT).

PASSIFLORA TENUILOBA Engelm. is also rarely found in Goliad Co.: caliche hills N of Rte. 59 2.5 mi SW of San Antonio River, *5899* (oc).

CACTACEAE: MAMMILLARIA LONGIMAMMA DC. is apparently found at its eastern range limit in Refugio Co. on caliche slopes, N bluff of Aransas River ca 7.5 mi SW of Woodsboro; a living plant was collected and can serve as a voucher (rk).

ONAGRACEAE: LUDWIGIA OCTOVALVIS (Jacq.) Raven is also found in Victoria Co.: along Coleto Creek 2 mi W of Rte. 77, *6367* (gol, oc, vic).

APIACEAE: HYDROCOTYLE UMBELLATA L. also occurs in Refugio Co.: Medio Creek at juncture with Blanco Creek ca 4.5 mi N of Woodsboro, *6768* (rk).

SANICULA CANADENSIS L. is also found in Goliad Co.: at San Antonio River crossing at Rte. 59, *5735* (NY, TAES) as well as in oak mottes in several locations in Refugio Co.

SPERMOLEPIS DIVARICATA (Walt.) Raf. is also rather frequent in Goliad Co.: caliche hill at N side of Rte. 59, 2.5 mi SW of San Antonio River crossing, *5019* (gol, oc, vic); N side of FM 2441 at Sarco Creek, *8587* (NY, VT); and in Victoria Co.: sandy terrace of Coleto Creek 2 mi SW of Rte.

77, *8338* (MARY, NY, VT).

OLEACEAE: FORESTIERA ACUMINATA (Michx.) Poir., while scarce, is also found in Victoria Co.: Coleto Creek bottomland 2 mi W of Rte. 77, *8361* (gol, oc, vic).

APOCYNACEAE: AMSONIA ILLUSTRIS Woods., already reported from Refugio Co. by Jones, is a locally common plant on open prairies of the Greta Ranch as well in the county ca 8.1 mi NE of Refugio, *10507* (gol, vic, VT).

ASCLEPIADACEAE: ASCLEPIAS VIRIDIFLORA Raf. also occurs in Goliad Co.: Rte. 59 0.7 mi SW of San Antonio River, *5493* (gol, oc, vic); terrace of Cadena Creek 0.6 mi E of Rte. 239, *5891* (oc); and is more widespread in Refugio Co. than indicated by Jones.

MATELEA GONOCARPA (Walt.) Shinners is also found in the Mission River bottoms S of Refugio, *5687* (gol, oc, vic).

CONVOLVULACEAE: CRESSA DEPRESSA Goodd. also occurs in Refugio Co.: alkaline flats along Melon Creek ca 1 mi S of Rte. 774, *4986* (oc, vic).

CUSCUTA GLABRIOR (Engelm.) Yuncker also occurs in Refugio Co.: pasture 3.8 mi N of Mission River crossing along FM 2678, *5125* (gol, oc, vic); Greta Ranch, prairie N of Rte. 77, 8.1 mi NE of Refugio, *5411* (oc, vic).

CUSCUTA INDECORA Choisy also occurs in Refugio Co.: frequent in salt marsh at FM 2678 and the Mission River, 5109 (TAES, VT); Devil's Run 1.5 mi S of Woodsboro along Rte. 77, *7749* (rk).

HYDROPHYLLACEAE: NAMA STENOCARPUM Gray is rare in Refugio Co.: margin of pond in Barn Pasture, 1.8 mi N of Woodsboro, *7221* (gol, oc, rk, vic).

BORAGINACEAE: HELIOTROPIUM INDICUM L. also occurs in Goliad Co.: bank of San Antonio River NE of Rte. 239 ca 7 mi SE of Goliad, *6254* (gol, oc, vic, VT).

HELIOTROPIUM TENELLUM (Nutt.) Torr. also occurs in Refugio Co.: dry ridge along Rte. 774 at Dry Creek, Refugio town line, *5705* (gol); N side of Devil's Run 1.5 mi S of Woodsboro, *7574* (gol, rk); S side of Sous Creek, Rte 77 6 mi S of Woodsboro, *8524* (MARY, oc, rk, vic).

MYOSOTIS MACROSPERMA Engelm. also occurs in Victoria Co.: Coleto Creek bottomland 2 mi W of Rte. 77, *8359* (gol, MARY, NY, oc, TAES, vic, VT).

VERBENACEAE: CALLICARPA AMERICANA L., while said by Jones to be primarily coastal, is quite frequent as well in the understory of live oak mottes throughout eastern San Patricio Co., Refugio Co., and eastward. Vouchers include: Refugio Co.: Greta Ranch, 8.1 mi NE of Refugio, Rte. 77, *5396* (oc, vic); and San Patricio Co.: 5 mi NE of St. Paul, SW side of Aransas River, *5840* (gol, VT).

PHYLA STRIGULOSA (Mart. & Gal.) Moldenke is frequently misspelled, as in Jones, as '*P. strigillosa*'.

VERBENA BRASILIENSIS Vell., an introduced weed recorded only from Nueces Co. by Jones, also occurs in Refugio Co.: E side FM 2678 ca 4 mi S of Rte. 774, *5977* (gol, oc, vic).

LAMIACEAE: MICROMERIA BROWNEI (Sw.) Benth. var. PILOSIUSCULA Gray is also occasional in Refugio Co.: E bank Mission River in cordgrass marsh ca 4.5 mi S of Refugio, *5370* (gol, oc, vic); margin of Medio Creek at juncture with Blanco Creek, 4.5 mi N of Woodsboro, *6767* (rk).

MONARDA FRUTICULOSA Epling, a south Texas endemic, said to occur only in Brooks and Kleberg Co. by Jones also occurs in Goliad Co.: sandy terrace of Cadena Creek 0.1 mi E of Rte. 239, *5866* (oc); in Refugio Co.: N bank of Aransas River terrace 0.5 mi E of Rte. 77, *7522* (rk); and in San Patricio Co.: Aransas River terrace, S side, ca 5 mi NE of St. Paul, *5795* (gol. oc, vic).

SOLANACEAE: SOLANUM CAMPECHIENSE L. is a plant apparently restricted in our region to drying pond beds, reported only from San Patricio Co. by Jones. It also occurs at its northern range limit in Refugio Co.: N side of Aransas River, dry pond, Rooke Ranch, 7 mi S of Woodsboro, *7150* (gol, oc, rk, vic).

SCROPHULARIACEAE: AGALINIS FASCICULATA (Ell.) Raf., while less frequent than the other species of the genus listed for our area, is also found in Refugio Co.: N side of Rte. 774 near intersection with FM 2678, *6179* (oc, vic).

BUCHNERA FLORIDANA Gand. is also occasionally found inland in Goliad Co.: sandy prairie along Rte. 183/77A 0.8 mi N of Little Sarco Creek crossing, *6075* (gol, oc, vic); FM 2441 at N side of Sarco Creek ca 8 mi S of Goliad, *5596* (oc, vic); and in Refugio Co.: 1.8 mi NE of FM 2441 and 0.8 mi NW of Rte. 77, Woodsboro, *7215* (rk).

LEUCOSPORA MULTIFIDA (Michx.) Nutt. was reported only from San Patricio Co. by Jones, but it also occurs in Goliad Co.: banks of San Antonio River NE of Rte. 239 ca 7 mi SE of Goliad, *6264* (gol, oc, vic); and in Refugio Co.: at juncture of Blanco and Medio Creeks ca. 4.5 mi N of Woodsboro, *7764* (rk).

VERONICA POLITA Fries is an introduced weed reported to be present only in Nueces Co. by Jones. It also occurs in Goliad Co. (and probably elsewhere): roadside and yards, River Ranch, Hwy. 239 3.5 mi SE of Rte. 183/77A, *6588* (gol, oc, vic).

ACANTHACEAE: SIPHONOGLOSSA GREGGII Greenm. & Thomps. is a south Texas species that apparently reaches its northern range limit in Refugio Co.: caliche bluff at N side of Aransas River near clay pit, Rooke Ranch, ca 1 mi of Rte. 77, *7900* (gol, oc, rk, vic).

RUBIACEAE: GALIUM TEXENSE Gray is most frequent on the Edwards Plateau, but occurs infrequently in our area. In addition to the localities cited by Jones, there are populations in Goliad Co.: caliche hills along Rte. 59 1.8 mi SW of San Antonio River crossing, *5044* (oc, vic); pasture SE

of Clip Ranch road 2.8 mi SW of Goliad, *5576* (oc, vic); and in Refugio Co.: Rooke Ranch, pasture near Chocolate Swale ca 6 mi S of Woodsboro, *6972* (gol, rk).

HEDYOTIS BOSCII DC. is a rather infrequent species, found locally inland in Refugio Co.: sandy margin of drying pond, Barn Pasture, 1.1 mi W of Rte. 77, 1.8 mi N of Woodsboro, *7222* (gol, oc, rk, vic).

HEDYOTIS CROFTIAE (Britt. & Rusby) Shinners is a south Texas endemic that apparently reaches its northern range limit in Refugio Co.: sandy hill in East Rogers Pasture 4.5 mi N of Woodsboro, *6781* (oc, rk).

RICHARDIA BRASILIENSIS Gomes is fairly frequent in Refugio Co. (its occurrence there noted by Jones) and is also found in Goliad Co.: E side of Rte. 183/77A near Little Sarco Creek crossing, *5542* (pf, VT); and San Patricio Co.: S bank of Aransas River ca 5.5 mi NE of St. Paul, *5778* (gol, oc, vic).

CAPRIFOLIACEAE: LONICERA JAPONICA Thunb. is a noxious weed also established in roadside thickets in Goliad Co.: Rte. 59 at Rte. 239 intersection, Goliad, *7063* (gol, oc, vic).

CUCURBITACEAE: CUCURBITA TEXANA Gray, a rather rare Texas endemic, is cited from San Patricio Co. by Jones. It also occurs in Goliad Co.: San Antonio River bottomland 2 mi N of River Ranch headquarters ca 7 mi SE of Goliad, *6111* (gol, oc, vic); and Refugio Co.: North Clarkson Pasture, near Medio Creek 2 mi N of FM 2441 ca 3.5 mi N of Woodsboro, *s.n.* (MARY). Within San Patricio Co. it also occurs along Aransas River 5 mi NE of St. Paul, *5847* (gol, oc, vic).

CAMPANULACEAE: TRIODANIS COLORADOENSIS (Buckl.) McVaugh is a rare species said to be endemic to the Edwards Plateau of Texas by C&J. Jones reported it from near Orange Grove, Jim Wells Co. It also occurs in Goliad Co.: caliche hills along Rte. 59 1.2 mi NE of FM 1351, *5057* (gol, oc, pf, vic).

ASTERACEAE: APHANOSTEPHUS KIDDERI Blake also occurs to the east of the localities cited by Jones in Refugio Co.: sandy terrace at N end of Packery Flats, W side FM 2678 near Mission River, *5948* (oc); caliche hill 1 mi E of Rte. 77, 8.5 mi SW of Woodsboro, *8436* (gol, oc, rk, vic).

ARTEMISIA GLAUCA Pall. was cited from San Patricio Co. by Jones. It also occurs in Refugio Co.: N terrace of Aransas River 1 mi E of Rte. 77, *7962* (OSU, rk, TAES).

ASTER PATENS Ait. was reported by Jones from Refugio Co.; it also occurs in Goliad Co.: caliche hills just W of McNamara Ranch headquarters, 2.8 mi SW of Goliad, *6328* (oc, vic).

CROPTILON DIVARICATUM (Nutt.) Raf. var. HOOKERIANUM (T. & G.) Shinners is also found in Goliad Co.: post oak savannah 1.7 mi SW of McNamara Ranch headquarters along ranch road, 4.5 mi SW of Goliad, *6127* (gol, oc, vic).

DRACOPIS AMPLEXICAULIS (Vahl) Cass. may be introduced in our area,

and also occurs in Refugio Co.: along ranch road, blackland prairie, Greta Ranch 2 mi NW of Rte. 77, 8.1 mi NE of Refugio, *8407* (oc, vic); and in Victoria Co.: roadside at intersection of Rte. 77 and Rte. 59 2.2 mi W of Victoria, *8420* (gol, MARY, MO, NY, oc, TAES, vic, VT).

ERIGERON MYRIONACTIS Small is also found inland in Refugio Co.: Greta Ranch entrance, Rte. 77 8.5 mi NE of Refugio, *4848* (oc, pf, vic); sandy pasture along Kelly Rd. ca 4.5 mi N of Woodsboro, *6785* (rk); caliche gullies, Lake Trap, Rooke Ranch ca 7.5 mi SW of Woodsboro, *6790* (rk); Recinda Bend of Aransas River, N terrace, ca 8.5 mi S of Woodsboro, *7285* (gol); pasture S of Sous Creek, ca 6 mi S of Woodsboro, Rte. 77, *8525* (oc).

ERIGERON PHILADELPHICUS L. was said by Jones to occur only in Refugio Co.; it also occurs in Goliad Co.: banks of San Antonio River 0.5 mi SW of Rte. 59 crossing, *8194* (gol, MARY, oc, vic, VT); and Victoria Co.: Coleto Creek bottomland 2 mi W of Rte. 77, *8360* (gol, MARY, oc, vic).

ERIGERON TENUIS Torr. & Gray is frequent in our area, known also from Victoria Co.: sandy terrace S of Coleto Creek, 2 mi W of Rte. 77, *8326* (gol, MARY, oc, vic, VT).

EUPATORIUM GLAUCESCENS Ell. is also found, though rarely, inland on the sandy terraces of Pleistocene age in Goliad Co.: W side of Rte. 183/77A 0.9 mi NW of Little Sarco Creek crossing, *6457* (oc, TEX).

GRINDELIA OOLEPIS Blake is a rare and rather local south Texas endemic whose distribution has been discussed by Mahler (1981). A new county record would be that found in Refugio Co.: along ranch road to building complex, Rooke Ranch, Ranch Traps, ca 6 mi S of Woodsboro, *7994* (gol, oc, rk, TAES, vic, VT).

GYMNOSPERMA GLUTINOSUM (Spreng.) Less. apparently reaches its eastern range limit in our area in Goliad Co.: caliche hills N of Rte. 59, 2.5 mi SW of San Antonio River crossing, *6278* (gol, oc, vic).

HETEROTHECA (CHRYSOPSIS) PILOSA (Nutt.) Shinners is also rather frequent inland on sandy terraces in Goliad Co.: along Cadena Creek at Rte. 239, *5589* (oc); W side of Rte. 183/77A 0.8 mi N of Little Sarco Creek crossing, *6073* (gol, oc, vic).

HYMENOXYS SCAPOSA (DC.) Parker also occurs on the caliche hills in Goliad Co.: N of Rte. 59 2.1 mi SW of San Antonio River crossing, *5738* (oc); in Refugio Co.: sandy terrace in North Clarkson Pasture ca 4.5 mi NW of Woodsboro, Rooke Ranch, *6746* (rk); and San Patricio Co.: Aransas River terrace ca 5 mi NE of St. Paul, *4742* (gol, oc, vic).

KRIGIA OPPOSITIFOLIA Raf. was cited from Refugio and San Patricio Co. by Jones. It is also fairly frequent in Goliad Co.: sandy terrace of Sarco Creek at FM 2441 crossing 8.5 mi S of Goliad, *4752* (gol); and Victoria Co.: south terrace of Coleto Creek 2 mi W of Rte. 77, *8310* (gol, oc, rk, vic).

LIATRIS ACIDOTA Engelm. & Gray was, according to Jones, found only NE of Rockport. I have also located a population inland in Goliad Co.: sandy

terrace along Little Sarco Creek 0.9 mi NW of Rte. 183/77A crossing, *6456* (oc, vic).

MACHAERANTHERA TENUIS (Wats.) Turner & Horne is an unusual disjunct in our area, being more frequent in Jeff Davis Co. in West Texas and in Mexico (C&J). Jones recorded it from Kleberg and San Patricio Co. It is also rather frequent in Refugio Co.: W terrace of Melon Creek ca 1 mi S of Rte. 774, *6206* (oc, VT); clay ridges near Fennessey Marsh 1.5 mi NW of Mission River crossing and FM 2678, *6418* (gol, oc, TEX, vic); Lake Trap, Rooke Ranch ca 7.5 mi SSW of Woodsboro, *7731* (gol, pf, rk, TAES, vic, VT); 0.5 mi N of FM 2441 in North Clarkson Pasture of Rooke Ranch 4.5 mi NW of Woodsboro, *7853* (rk).

PLUCHEA ODORATA (L.) Cass. is the name for *P. purpurascens* (Sw.) DC. as interpreted by C&J and Jones.

THELESPERMA AMBIGUUM Gray is also rarely found in Goliad Co.: caliche hill just S of San Antonio River 1 mi NE of McNamara Ranch headquarters, 1.8 mi SW of Goliad, *5914* (oc).

VERBESINA MICROPTERA DC. was recently reviewed by Olsen (1979). My earlier remarks (1981) that it should be considered synonymous with *V. virginica* to which it is closely related should be viewed in light of Olsen's interesting evidence to the contrary. It seems that *V. microptera* is, indeed, a good species showing geographic isolation as well as morphological differences.

VERNONIA TEXANA (Gray) Small was said to occur only in Refugio Co. by Jones. It also occurs in Goliad Co.: 0.8 mi NW of Rte. 183/77A crossing over Little Sarco Creek, *6072* (gol, oc, vic).

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A NAME FOR A WELL-KNOWN MEXICAN SPECIES OF *IRESINE* (AMARANTHACEAE)

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ABSTRACT

The earlier and correct name for what has been called *Iresine grandis* Standl. actually is *I. cassiniiformis* Schauer. The species to which the latter name has been misapplied is recognized here as *I. orientalis*, sp. nov. *Iresine orientalis* is known from the mountains of Tamaulipas, Nuevo León, San Luis Potosí, Querétaro, and Hidalgo; its closest relative is *I. discolor* Greenm. from Oaxaca and Puebla.

The type specimen of *Iresine cassiniiformis* Schauer represents a species that has been identified by the much more recent name, *I. grandis* Standl. The very distinctive plants heretofore known in most herbaria as *I. cassiniiformis* (see Standley 1922) are named for the first time below.

IRESINE **orientalis** Nesom, sp. nov.

Differt a *I. discolor* Greenm. foliis fuscatioribus (schistaceis) tenerioribus angustioribus spicis pedunculatis elongatis sepalis staminalibus oblongi-ellipticis.

Erect dioecious shrubs 0.6–1.5 m tall. Stems densely pubescent in area of inflorescence, glabrescent below. Leaves ovate to ovate-lanceolate with rounded to acute, apiculate apices, 3–10(-12.5) cm long, 1.3–6 cm wide, thick, usually with depressed veins above, somewhat rugose, short-pubescent above to glabrescent and smooth with age, densely woolly below with conspicuously whitish hairs, the hairs very short, never silky or long enough to appear "combed" (all oriented in the same direction). Panicles somewhat open, sometimes arching or drooping; spikes sessile or very short-pedicellate. Staminate and pistillate bracts scarious, glabrous; sepals 1-nerved, staminate oblong-elliptic, 2–2.2 mm long, glabrous or very sparsely short-pilose, pistillate broadly ovate-elliptic, 1.2–1.5 mm long, densely long-pilose over whole surface but longest hairs arising from the base. Utricles 1.1–1.3 mm long; seeds shiny golden-brown.

TYPE: MÉXICO. NUEVO LEÓN: Monterrey, 17-26 Feb 1980, *E. Palmer 1133* (HOLOTYPE: US!; ISOTYPE: US!).

Representative specimens examined: MÉXICO. HIDALGO: slopes and summits of Cerro de las Canteras, near Puerto de San Pedro, KM 104 on hwy from Pachuca to Actopan, 2500–2700 m, 9 Oct 1946, *Moore 1385* (US); NUEVO LEÓN: on cliffs, Sierra Madre above Monterrey, 750 m, 4 Apr 1906, *Pringle 13728* (US); ca 24 km SW of Galeana, waterway below Alamar, ca 1350–1500 m, common in the open wood, 30 May 1934, *C. H. and M. T. Mueller 631* (US); QUERÉTARO: ca 80 km NE of Querétaro, lower limit of piñon-juniper belt in dry mts. above Pilón on

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road to Pinal de Amoles, ca 2700 m, 24 Apr 1949, *McVaugh 10365* (US); TAMAULIPAS: 13 km S of Cd. Victoria along rte. 70, 7 Apr 1961, *King 4525* (US); vicinity of Victoria, ca 320 m, 1 Feb–9 Apr 1907, *Palmer 203* (US); Victoria, common on mountainside, 800 m, 23 Mar 1925, *Runyon 797* (US).

A feature that distinguishes *Iresine orientalis* from nearly all of its Mexican congeners is the lack of any pubescence on the floral bracts, both staminate and pistillate. *Iresine orientalis* also can be separated from sympatric plants of the *I. calea* (Ibañez) Standl. group by its thick, subrugose leaves with conspicuously white abaxial pubescence of relatively short trichomes that appear woolly or sometimes densely tufted. Corresponding pubescence of the *I. calea* group is yellowish or tawny and of long hairs that are usually pilose and often all oriented in the same direction.

Iresine discolor Greenm. appears to be the closest relative of *I. orientalis*; it has a similar habit, leaves with dense, white abaxial pubescence of short hairs, and strong similarities between the flowers. The leaves of *I. discolor*, however, are darker, thinner, narrower, more elliptic, and more pubescent above, and the staminate sepals of this species are triangular, compared to the oblong-elliptic ones of *I. orientalis*; also, as pointed out by Standley (1922), the spikes of *I. discolor* are nearly all pedunculate and elongate (vs. sessile and short in *I. orientalis*). Finally, the two species appear to be allopatric, as *I. discolor* is known only from Puebla and Oaxaca.

The match of the type of *Iresine cassiniiformis* with other plants of the species (synonym = *I. grandis*) is clear. It also appears to be at least a duplicate of the collection originally cited by Schauer, one made by Alwin Aschenborn from south central Mexico in about 1842. I have found no indication that a type of this species has ever been examined since the original publication. However, until my study of Aschenborn and his Mexican collections (in prep.) is complete, I will refer to this sheet simply as a type without specifying whether it should serve as holotype or isotype: *Iresine cassiniiformis* Schauer, Linnaea 19:709. 1847; Mexico, no other collection data, *Aschenborn 691* (WRSL!). The original publication cited *Aschenborn 169* as the collection number, but the sheet reads *691*. The type of *Senecio schumannianus* Schauer is also marked *Aschenborn 691*; nevertheless, I have still cited the number as it appears on the *Iresine* sheet, although a labelling error may have been involved. An indication that the WRSL sheet probably may not have been the holotype is that the specimen is pistillate, while the original description mentioned only stamens. *Aschenborn 617* and *618* were also cited by Schauer as representative of *I. cassiniiformis*, but I have not seen these sheets.

Standley and Steyermark (1946) observed that *Iresine cassiniiformis* (as *I. grandis*) has been reported from Guatemala under the name *I. canescens* Humb. & Bonpl. ex Willd. (Sp. Pl. 4:765. 1806.), and I have seen annotations to the same effect. However, the original description of *I. canescens* noted "panicula ramosa diffusa" in sharp contrast to the ex-

tremely dense inflorescences of *I. cassiniiformis*. *Iresine canescens* is probably part of the *I. calea* group and is one of the oldest (and currently unused) names available among those taxa.

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JUVENILE AND ADULT LEAFLET PHASES IN *ARALIA SPINOSA* (ARALIACEAE)

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Aralia spinosa L. (Araliaceae) is a shrub or small tree ranging through most of the eastern United States (Fernald, 1950). Its several common names (e.g. Prickly Ash, Hercules'-club) emphasize the commonly prickly condition (not spiny; cf. Radford et al, 1968; nor thorny, cf. Gleason, 1952) of its upper stem and compound leaves. The leaves are generally described as prickly on the petiole and rachis; they are often prickly on the major veins of the ultimate leaflets, also. The species is typically distinguished, in part, in various keys (Fernald, 1950; Correll & Johnston, 1970; Steyermark, 1963) from the similar but herbaceous species *A. racemosa* L. by the presence of prickles on *A. spinosa* and their absence on *A. racemosa.* Some specimens of *A. spinosa*, however, have few or no prickles on the leaves (Tucker, 1976; Smith, 1978). Furthermore, a study of herbarium material at UARK undertaken by the author disclosed a suite of leaflet characteristics that are correlated with the prickle-less condition (Table 1; Figure 1).

My first impression of this dimorphic condition in *A. spinosa* was that perhaps the prickle-less phase represented a new variety. However, there was no evident correlation between geography or soil type and the prickled or prickle-less phases in Arkansas; the two phases appeared to be randomly scattered through the range of the species.

My second impression was that perhaps the prickle-less phase represented a seasonal or local environmental response of the species. Evidence from repeated collecting through the season of two different populations of the species (kindly performed by Marie P. Locke of Pine Bluff, a volunteer collector for the UARK herbarium) failed to support this second impression. Mrs. Locke sampled at monthly intervals through the 1981 growing season a brightly lit population (edge of woods; *Locke 3026 A-E*, Grant Co.; UARK) and a dimly lit population (deep woods; *Locke 3025 A-E*, Jefferson Co.; UARK) of *A. spinosa* in southern Arkansas. No significant differences were found between the two populations, nor between early-season and late-season material.

Additional study of herbarium materials at UARK and of living material in Franklin County, Arkansas (*Smith 3657 A-C*; UARK) indicated that the suite of leaflet characters (Table 1) is always associated with the blooming and fruiting of *A. spinosa.* The species thus exhibits a juvenile and an

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Table 1. Leaflet morphology of the juvenile and adult phases of *A. spinosa*.

LEAFLET CHARACTER	JUVENILE PHASE	ADULT PHASE
Prickles	Several to many on major veins and petiolules.	Few or none.
Teeth	Sharply serrate.	Serrulate to nearly entire.
Shape	Ovate.	Ovate-oblong to elliptical-oblong.
Texture	Thin, drying flat.	Thickish, drying more or less revolute.
Apex	Acuminate.	Acute to short-acuminate.
Base	Rounded to cordate, often oblique.	Slightly rounded to cuneate.

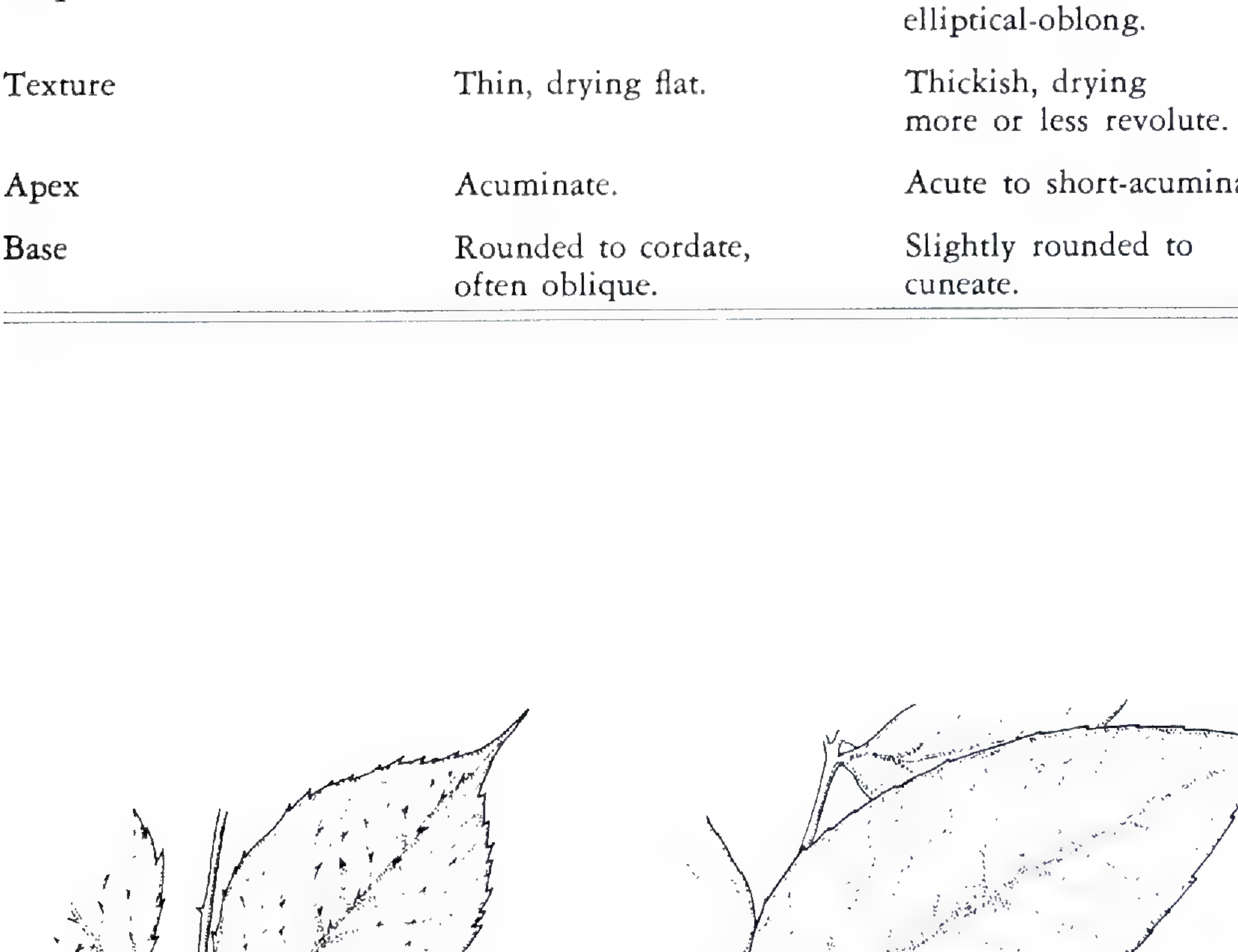

Figure 1. Drawings of the ultimate leaflets of *Aralia spinosa*; A = juvenile phase, B = adult phase; both ca 0.55X.

adult phase, and the prickle-less condition represents the adult phase. The adult phase is exhibited on the leaves at the several nodes below each inflorescence. Both juvenile (on sterile branches) and adult (on fertile branches) phases can occur on the same shrub (cf. *Smith 3657 A-C*). The adult phase was observed on fruiting material from Georgia and Tennessee, which indicates that the phase is characteristic of fruiting material through the range of the species.

English Ivy, *Hedera helix* L., another member of the Araliaceae, has for a number of years been known to be dimorphic, with juvenile and adult leaf phases (cf. Bailey, 1949).

It is significant that *A. spinosa* is most noticeable (when in flower and fruit) at the very time when the leaflets have few or no prickles. It follows naturally from the above that authors of manuals and keys should take into account the dimorphic nature of *A. spinosa* leaflets and design keys to include both the juvenile and adult phases of the species.

A suggested key to distinguish the eastern United States species of *Aralia* follows:

1. Plants acaulescent, the single leaf arising at ground level..... *A. nudicaulis* L.
1. Plants caulescent, with several to many leaves borne on the stem.....2
   2. Plants herbaceous, typically 0.3–2 (-3) m tall, the stem unarmed or with small bristle-like prickles; leaves monomorphic (all similar in pubescence, cutting, and leaflet shape, though reduced in size toward apex of the stem).....3
      3. Umbels few (ca 2–10); stem (and often the leaves) bearing bristle-like prickles..... *A. hispida* Vent.
      3. Umbels numerous in a large panicle; stem and leaves lacking prickles ..... *A. racemosa* L.
   2. Plants woody, typically 3–6 (-10) m tall, the stem armed with large, coarse, broadbased prickles; leaves dimorphic—the *juvenile* phase with many prickles and thin serrate leaflets, the *adult* phase with few or no prickles and thickish serrulate to subentire leaflets *A. spinosa* L.

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RELATIONSHIP BETWEEN *DIGITARIA MILANJIANA* (POACEAE: PANICEAE) AND THE ANNUAL SPECIES OF *DIGITARIA* SECTION *DIGITARIA* IN NORTH AMERICA[1]

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ABSTRACT

Morphological, anatomical, and cytological data were used to show the taxonomic relationship between the perennial *Digitaria milanjiana* and the annual species of *Digitaria* section *Digitaria* (*D. bicornis, D. ciliaris, D. horizontalis, D. nuda, D. saguinalis* and *D. setigera*). A phenetic analysis showed populations of *D. milanjiana* form a distinct cluster separate from the most closely related annual (*D. bicornis*), and a statistical analysis showed these species differed significantly on 16 of the 20 characters measured. A nested analysis of variance gave corresponding results. Instead of characters pertaining to longevity, it is suggested that the total absence of leaf pubescence, the presence of spicules on the lower lemma nerves, a narrow lateral branch, and a short and narrow bract blade be used to segregate *D. milanjiana* from the annual taxa. An analysis of North American populations of *D. milanjiana* showed no justification for the recognition of subspecific categories of this species. In addition, general shape and average size of the epidermal long cells and the association of sclerenchyma tissue with second-order vascular bundles differed between the annual taxa and *D. milanjiana*. Cytologically, *D. milanjiana* was found to be both male and female sterile, whereas the annuals were highly male fertile and produced a normal embryo sac. It was concluded that a measurable and definable difference exists between *D. milanjiana* and the annual members of the section *Digitaria*.

Stapf (1919) transferred *Panicum milanjiana* Rendle to *Digitaria* and placed this species in the subsection *Sanguinales*. At that time Stapf recognized two sections and nine subsections of *Digitaria* and considered spikelet pubescence patterns to be taxonomically important at subgeneric levels. Included within the *Sanguinales* were both robust perennials and weak decumbent annuals. In his monographic work of *Digitaria*, Henrard (1950)

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segregated Stapf's *Sanguinales* into four sections which included the *Erianthae, Horizontales, Parviglumae*, and the original *Sanguinales*. Henrard restricted the *Erianthae* to the robust perennials native to Africa, whereas most of *Sanguinales* were annuals which lacked stolons. Henrard distinguished the *Parviglumae* and *Horizontales* from the *Sanguinales* on the relative size of the glumes and inflorescence characteristics. These sections were realigned by Veldkamp (1973), who recognized the section *Digitaria* within the subgenus *Digitaria* to encompass the *Horizontales, Parviglumae, Sanguinales*, and *Biformes*. North American members of these sections intergrade (Webster 1981), and the concept of combining them into one section is certainly justified. Veldkamp (1973) maintained the *Erianthae* as a separate section. Agrasar (1974) in her treatment of *Digitaria* in Argentina combined the *Sanguinales* and *Erianthae* (*D. decumbens* Stent) into the section *Digitaria*. Agrasar's treatment represented a reversal to Stapf's (1919) original subgeneric concept.

Members of African *Erianthae* have been widely introduced into temperate and tropical regions of the world as grasses for improved pastures. The most important of these species included *D. pentzii* Stent, *D. decumbens*, *D. eriantha* Steudel, and to a lesser degree *D. milanjiana*. Recent studies of *Digitaria* have shown that *D. milanjiana* occurs in North America even though it has been unreported from this hemisphere. This species was found to dominate the sandy coastal plain of eastern Mexico from just south of Ciudad Victoria to Villa Hermosa, and specimens were observed from the Caribbean and Central America. It also has escaped cultivation and occurs sporadically in southern Texas and Florida. Hodges, et al. (1975) stated that *D. decumbens* was first introduced into the United States in 1935 from Pretoria, South Africa, and was planted on an estimated one million acres on the Gulf Coast of Mexico. Based on its present distribution, it seems likely that this introduction was actually *D. milanjiana* rather than *D. decumbens*.

Digitaria milanjiana is morphologically closely related to the annual species of the section *Digitaria* [*D. bicornis* (Lamk.) R&S, *D. ciliaris* (Retz.) Koeler, *D. horizontalis* Willd., *D. nuda* Schum., *D. sanguinales* (L.) Scopoli, and *D. setigera* Roth.]. Webster and Hatch (1981) defined this complex as consisting of annuals with paired lanceolate spikelets on a winged primary branch. *Digitaria milanjiana*, as do other members of the *Erianthae*, has the identical spikelet shape, arrangement, and inflorescence characteristics of the annual species. The identification of this species is further complicated by the fact that the perennial nature of *D. milanjiana* is seldom represented on herbarium sheets. Specimens were found to be frequently misidentified as *D. ciliaris*, *D. bicornis*, or even *D. sanguinales*. The objectives of the present study were to: 1) report the occurrence of *D. milanjiana* in North America and to give a detailed morphological description of this species, 2) phenetically and statistically compare *D. milanjiana* to the most

closely related annual species based on characters considered to be of taxonomic importance within the annual complex, and 3) anatomically and cytologically compare *D. milanjiana* to members of the annual complex.

METHODS

Collections of *Digitaria* were made in the eastern United States and throughout Mexico. A total of 245 populations were sampled, including 17 populations of *D. milanjiana* and 228 populations of the annual complex. At each collection site, ten independent specimens were collected and pressed. To insure isolation between adjacent populations, at least 20 km were travelled between collection sites. All specimens from the 245 populations or 2,450 specimens were used in the numerical analysis. On each specimen measurements of 20 characters (Table 1) were recorded. These included seven spikelet characters, seven inflorescence characters, and six characters from the vegetative part of the specimens. It should be noted that characters pertaining to the perennial nature of *D. milanjiana* were not recorded as it was an objective to distinguish this species based only on those characters considered taxonomically important within the annual complex.

A variety of numerical techniques were employed to delimit and define the phenetic and statistical relationships among the populations. Data were analyzed using the Statistical Analysis System (SAS) (Barr, et al. 1976) and the Numerical Taxonomic System of Multivariate Statistical Programs (NT-SYS) package (Rohlf, et al. 1971). Correlation and distance phenograms, principal components analysis (PCA), and multivariate analysis of variance (MANOVA) (Schmidly and Hendricks 1976) were used to show the phenetic relationship among the populations. Basic statistical procedures were used to analyze the variation between and within the population clusters. These clusters were compared on the basis of character means, ranges, standard deviations, coefficients of variation, and F-values. A nested analysis of variance procedure was employed to give the relative percent variation due to differences between taxa, among populations, and among specimens within populations. Correlation coefficients were used to show the relationship between characters for a species. Finally, discriminant analysis was used to test the distinctiveness of the taxa.

Material for anatomical and cytological examination was collected for each of the populations. Live material was killed and fixed in 3:1 (V/V) ethanol and glacial acetic acid for 12 hours, transferred to 70 percent ethanol and refrigerated until examination. Adaxial epidermal peels of leaf blades were made by scraping away the abaxial surface and extraneous matter with a razor blade, cleared in full strength bleach for 5 minutes, and viewed with a light microscope with phase-contrast. Ovaries were carefully dissected from the upper floret, cleared with methyl salicylate (Young, et al. 1979), and observed under phase-contrast. Pollen fertility counts were made by staining the pollen with cottonblue in lactophenol (Radford, et al. 1974).

Table 1. Variables measured for population analysis.

	VARIABLE	ABBREVIATION	PRECISION
1	Spikelet length	(SL)	0.1 mm
2	Spikelet width	(SW)	0.01 mm
3	Length of first glume	(LFG)	0.01 mm
4	Length of second glume	(LSG)	0.1 mm
5	Distance to lateral nerve on sessile spikelet	(DLS)	0.01 mm
6	Distance to lateral nerve on pedicelled spikelet	(DLP)	0.01 mm
7	Spicules on lateral nerves	(SN)	0.01 mm
8	Pedicel length	(PL)	0.1 mm
9	Lateral branch length	(RL)	1.0 mm
10	Lateral branch width	(RW)	0.1 mm
11	Length of main axis	(LMA)	1.0 mm
12	Number of lateral branches	(LB)	—
13	Number of spikelets	(NS)	—
14	Length of setaceous hairs on lower pulvinus	(LH)	0.1 mm
15	Length of bract blade	(LLB)	1.0 mm
16	Width of bract blade	(WBB)	1.0 mm
17	Length of bract sheath	(LBS)	1.0 mm
18	Setaceous hairs in the ligule region	(SLH)	—
19	Ligule length	(LL)	0.1 mm
20	Distance of pubescence up sheaths	(DP)	1.0 mm

Pollen grains completely filled with blue stain were classified as viable, whereas pollen with no stain or partially stained were classified as inviable.

RESULTS AND DISCUSSION

A phenetic analysis of all populations collected showed *D. milanjiana* to be most closely allied to *D. bicornis* (taxonomic relationships among members of the annual complex are to be the topic of a future publication and will not be discussed here). Populations of *D. milanjiana* were clustered with those of *D. bicornis* as a result of a number of morphological similarities. These similarities included the distance to the lateral nerves on the lower lemma, small or nonexistent main axis, few setaceous hairs in the ligular region, spikelet length, and length of the second glume. The phenetic relationship among the 17 populations of *D. milanjiana* and 43 populations of *D. bicornis* is shown by a correlation phenogram ($r = 0.91$) (Figure 1). The OTU's correspond to population collection numbers of the senior author (collections are on deposit at L, MO, NY, TAES, and US). This analysis showed two distinct population clusters. The smaller cluster contained the perennial species and showed relatively little variation among the populations. Populations of the annual species comprised the larger cluster. Populations of *D. milanjiana* were collected in eastern Mexico from Ciudad Victoria to Villa Hermosa where it was found to be abundant. *Digitaria bicornis*

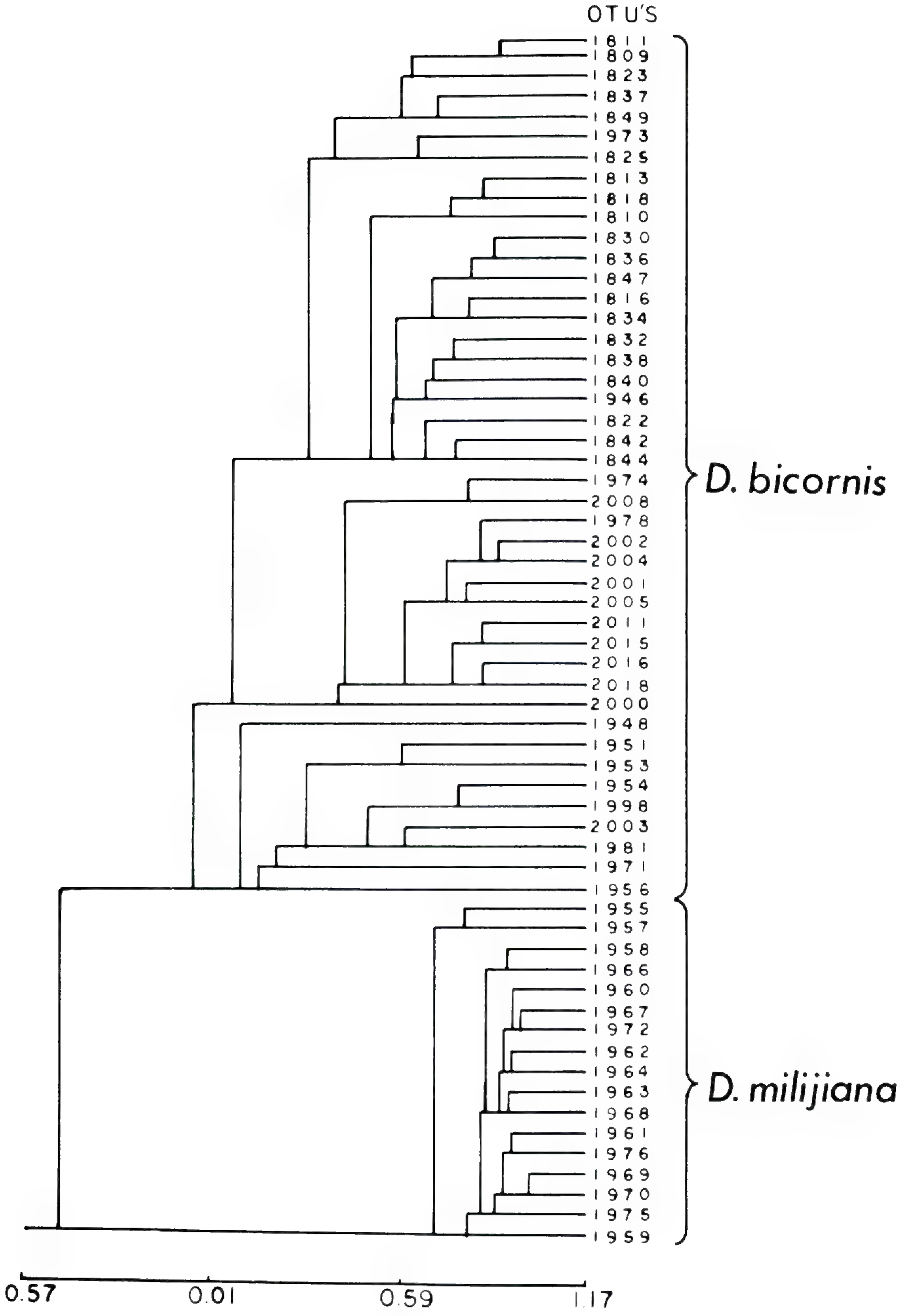

Fig. 1. Correlation phenogram (r = 0.91) of 43 populations of *Digitaria bicornis* and 17 populations of *Digitaria milanjiana*.

populations were collected in the southeastern United States (Webster 1980) and essentially throughout Mexico.

PCA on these populations also showed a clear separation of the taxa. Approximately 60 percent of the variation was accounted for by the first two components. Populations of *D. milanjiana* were separated from those of *D. bicornis* based on characters contributing to the first component. The most important characters (importance of the characters was based on the relative size of the intracomponent correlations) were spikelet width, lateral branch length, bract blade length, and second glume and ligule length.

A basic statistical comparison (Table 2) was made between the 17 populations of *D. milanjiana* and the 20 most closely related annual populations of *D. bicornis*. *Digitaria milanjiana* differed significantly ($p < 0.0001$) from the annual on 16 of the 20 measured characters. Length of the second glume, spikelet width, and length of the first glume were spikelet characters with the highest F-values. Range overlaps existed for each of these characters. Spikelets of *D. milanjiana* are lanceolate with villous hairs between the lateral nerves of the seven nerved lemma of the lower floret (Figure 2). Minute scabrosities are present on all nerves of the lower lemma, which is a characteristic that can be consistently used to separate this species from other members of the *Erianthae*. The first glume is triangular in shape and glabrous, whereas the second glume is lanceolate, three nerved, pubescent (Figure 3). Four characters of the inflorescence were significant, the most

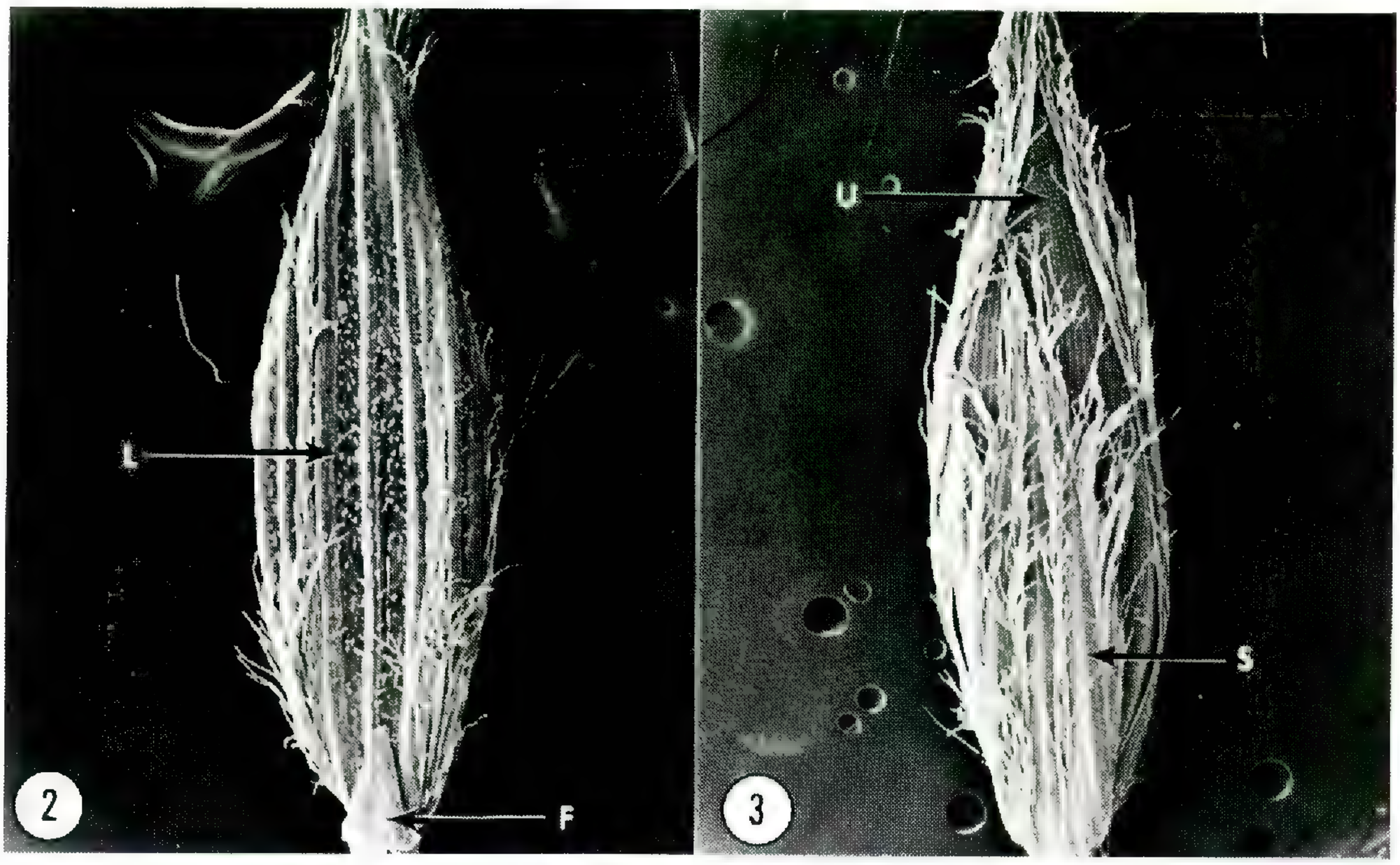

Fig. 2-3. Scanning electron micrographs of the spikelet of *Digitaria milanjiana* (Webster 1955, ca 20 X). Fig. 2. Abaxial orientation of the spikelet showing the first glume (F) and lemma of the lower floret (L). Fig. 3. Adaxial orientation of the spikelet showing the second glume (S) and lemma of the upper floret (U).

Table 2. Means, ranges, standard deviations, coefficients of variation, and F-values for 20 characters of *D. milanjiana* and *D. bicornis*. Distance given in millimeters.

	Digitaria milanjiana N = 170				*Digitaria bicornis N = 199*				
	MEAN	RANGE	S	C.V.	MEAN	RANGE	S	C.V.	F-VALUE
SL	2.98	2.5-3.3	0.14	4.64	3.21	2.6-3.6	0.19	5.77	173.2*
SW	0.78	0.67-0.90	0.05	6.28	0.89	0.73-0.99	0.06	6.52	440.3*
LFG	0.36	0.23-0.47	0.05	13.23	0.27	0.00-0.47	0.06	21.29	304.8*
LSG	1.76	1.5-2.2	0.12	6.65	2.32	1.8-2.8	0.21	8.93	973.8*
DLS	0.20	0.17-0.27	0.24	12.17	0.19	0.13-0.27	0.02	11.53	5.2
DLP	0.20	0.13-0.30	0.25	12.18	0.22	0.17-0.27	0.03	11.68	62.5*
SN	0.83	0.0-2.9	0.93	112.88	0.17	0.0-1.3	0.33	215.18	101.4*
PL	2.67	1.4-3.1	0.32	14.76	2.19	1.4-4.2	0.38	17.42	0.5
RL	126.18	70-169	18.43	14.60	139.98	71-206	25.18	17.99	35.8*
RW	0.56	0.4-0.8	0.08	13.55	0.95	0.8-1.3	0.14	14.73	1098.4*
LMA	0.42	0-12	1.89	453.16	2.50	0-40	7.79	311.19	13.2
LB	0.01	0-1	0.10	919.22	0.10	0-3	0.41	412.26	7.5
NS	12.18	9-19	1.83	15.04	7.86	5-13	1.47	18.72	679.0*
LH	0.01	0.0-0.3	0.04	605.11	0.06	0.0-0.7	0.11	178.49	45.9*
LBB	28.18	6-126	17.07	60.59	69.46	21-249	33.26	47.88	183.4*
WBB	1.80	0-6	0.97	53.64	4.49	2-9	1.15	25.69	566.9*
LBS	180.34	60-242	26.03	14.44	138.18	82-228	27.01	19.55	253.2*
SHL	—	—	—	—	8.82	0-66	5.12	58.05	487.4*
LL	1.10	0.4-2.2	0.28	25.07	2.05	1.0-3.5	0.43	21.27	604.1*
DP	—	—	—	—	32.46	0-78	16.20	49.90	606.8*

* $P < 0.0001$

important of these included a narrower lateral branch and more spikelets per unit length of lateral branch. Pedicels of *D. milanjiana* are triangular in cross section with scabrosities on the angles. The wing of the lateral branch is only slightly smaller than the body and distinctly scabrous on the margins. This species has digitate lateral branches and only rarely will possess a main axis. The lowermost pulvinus is covered with short hispid hairs. *Digitaria milanjiana*, as it exists in North America, can easily be distinguished from members of the annual complex based on the glabrous nature of the leaves. Papillose-based setaceous hairs are absent from the throat of the ligular region which is a characteristic of the annual complex. The first leaf subtending the inflorescence (bract blade) of the perennial was found to be significantly shorter and narrower than those of the annuals. Finally, the ligule of *D. milanjiana* was significantly shorter than other species examined.

A nested analysis of variance procedure was employed to further illustrate the statistical relationship existing between these species. This procedure gives the relative percent variation due to specimens within populations, among populations, and btween taxa. Ideally, if two distinct species are being compared then a higher percent of the variation will be accounted for at the species level. Eleven of the 20 characters (Table 3) had more

Table 3. Relative percent variation due to differences among specimens, within populations, among populations, and between taxa of *D. milanjiana* and *D. bicornis*.

	SPECIMENS	POPULATIONS	TAXA
SL	29.46	23.83	46.71
SW	26.53	5.34	68.13
LFG	30.56	8.27	61.17
LSG	8.22	8.13	83.65
DLS	86.06	10.37	3.56
DLP	71.15	7.11	21.74
SN	60.19	8.34	31.47
PL	74.65	25.35	0.00
RL	58.12	27.47	14.32
RW	12.04	2.58	85.37
LMA	46.20	50.80	3.00
LB	88.16	8.92	2.92
NS	13.59	9.49	76.92
LH	79.97	6.78	17.25
LBB	26.25	21.06	52.69
WBB	15.93	8.70	75.37
LBS	32.75	12.21	55.05
SHL	21.83	5.12	73.05
LL	17.13	6.61	76.26
DP	16.17	5.29	78.54

than 50 percent of the variation due to differences between species. These were the same characters possessing the highest F-values (Table 2). Except for length of the main axis (LMA), a relatively low percent of the variation was accounted for at the population level. A discriminate analysis procedure was used to test the distinctness of *D. milanjiana* and *D. bicornis*, and there was no misclassifications of the 369 specimens tested.

Correlation coefficients were used to show the relationship between characters of a species. Significant ($P < 0.0001$) correlation coefficients existed between 18 character combinations of *D. milanjiana*. Highest positive values were between PL-SL, RL-LBS, and WBB-LBB. Significant negative correlations existed between NS-PL and between NS-RL. As lateral branches increase in length, the number of spikelets per unit area decrease, thereby showing a consistency as to the number of spikelets on a lateral branch.

Henrard (1950) recognized one subspecies and one variety of *D. milanjiana*. The question then arises as to the possibility of subspecific categories of this species in North America. The first three vectors of a MANOVA procedure on populations of *D. milanjiana* accounted for 58.9 percent of the variation, which is relatively low for this type of analysis and is indicative of a homogeneous group of populations. A separation of any group of populations did not exist. An analysis of variance on these 17 populations showed that there were significant differences ($P < 0.0001$) among six of the characters measured. These included SL, PL, RL, RW, NS, and LL. However, the highest F-value was only 6.39. Duncan's multiple range test showed that these differences could not be correlated to any specific group of populations. For example, whereas one group of populations might differ significantly from other populations on SL, the same group would not be significantly different for any of the other characters. It was concluded that these differences were the expected variation among populations over a wide geographic area and, thereby, taxonomically insignificant. Based on North American specimens and characters measured in this study, no subspecific categories of *D. milanjiana* should be recognized and may indicate a single or low number of introductions of this species in the Western Hemisphere.

Characteristics of the leaf epidermis and internal anatomy were studied using members of the annual complex and *D. milanjiana*. Obvious differences existed between the perennial and the annuals. Walls of long cells of *D. milanjiana* were straight to slightly wavy with rounded corners. Long cell walls of the annuals were undulating to sinuous with distinctly angled corners. Internal leaf anatomy showed that all specimens examined were C_4 subtype NADP-ME. Sclerenchyma tissue occurred over most of the vascular bundles in *D. milanjiana* but was associated only with first-order vascular bundles in the annual species.

A cytological comparison including embryo sac formation and pollen fertility was made between the *D. milanjiana* and the annual species. Numer-

ous ovaries were examined in each species. Normal megasporogenesis of the polgyonum type was observed in each of the annual taxa. The mature embryo sac consisted of two synergids, one egg cell, two polar nuclei, and proliferating antipodals. Normal embryo sac formation was not observed in *D. milanjiana.* At some stage prior to anthesis the ovary withered and degenerated. This evidence suggests that this species is female sterile. Pollen fertility counts were made on 25 populations of the annual taxa and on four populations of *D. milanjiana.* The annuals were found to be highly male fertile, and no differences were observed among the taxa. Positive stains were observed on 94 to 99 percent of the pollen in each taxon. *Digitaria milanjiana* was found to be highly male sterile with approximately 1 percent of the pollen giving a positive stain. Apparently, in North America this species reproduces by runners and lateral branching from short, knotty rhizomes.

CONCLUSIONS

Digitaria milanjiana, a native of Africa, is an introduced species in North America and presently occurs in southern Texas, Florida, eastern Mexico, Central America, and the Caribbean. Based on taxonomically important characters within the annual complex, *D. milanjiana* is both phenetically distinct and statistically different from the most closely related annual species (*D. bicornis*). Instead of characters pertaining to the perennial nature of the species, it is suggested that absence of leaf pubescence, spicules on the mid-nerve of the lower lemma, lateral branch width, bract blade width, and the number of spikelets per unit area of lateral branch be used to distinguish *D. milanjiana* from the annual species.

Evidence presented in this study suggests that a measurable and definable difference exists between *D. milanjiana* and the annual members of the section *Digitaria.* The placement of *D. milanjiana* or any other member of the *Erianthae* into the section *Digitaria* is not warranted.

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NEW SPECIES OF *CLITORIA* SUBGENUS *BRACTEARIA* SECTION *CAULIFLORAE* (FABACEAE) FROM NORTHERN SOUTH AMERICA[1]

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Members of *Clitoria* L. subgenus *Bractearia* (Mart. ex Benth.) Fantz section *Cauliflorae* Fantz are typically lianas that bear both cauliflorous inflorescences below the leaves and often axillary inflorescences in the upper leafy portions of the plant. Within the genus *Clitoria* cauliflory is unique to section *Cauliflorae*. Flowers with narrow bracteoles and conspicuous calyx lobes distinguish members of section *Cauliflorae* from lianas belonging to other sections of subgenus *Bractearia*, particularly when a specimen might not exhibit cauliflory. Section *Cauliflorae* comprises the following species (Fantz, 1982): *C. arborescens* R. Brown in Ait., *C. cavalcantei* Fantz, *C. coriacea* Schery, *C. javitensis* (HBK) Benth., *C. leptostachya* Benth., *C. obidensis* Huber, *C. plumosa* Fantz, *C. sagotii* Fantz, *C. selloi* Benth., *C. tunuhiensis* Fantz, and the two species described below. *Clitoria sagotii* was originally described with only a short diagnosis (Fantz, 1979). A more complete description is given here plus descriptions of two new varieties of that species.

1. CLITORIA kaieteurensis Fantz, *sp. nov.*

Vites lignosi trahes vel scandes. Folia trifoliata, foliolis ellipticis, oblongo-ellipticis, ovato-ellipticis vel ovatis, obtusis, abrupte breviacuminatis. *Stipulae et stipelae magnopere elongati, 8–19 mm. Inflorescentiae brevissimae 0.5 cm*, axillares et cauliflores, pauciflorae. *Flores magni, 6–7.5 cm. Bracteolae magni*, 9–12 mm longae, *3–5 mm latae. Calyces trichomatibus microuncinatis, tubo 11–17 mm, lobis 7–13 mm.* Stylus elongatus, 23–27 mm, longitudine ovarium magnopere superantes. Legumen stipitatum, planum, trichomatibus microuncinatis praecipue cum macrotrichomatibus dispersis, rufus, fere erectis. *Savannae Kaieteur (Guyanae) endemicae.*

Liana, trailing along ground or climber to 6–10 ft high. *Leaves* 3-foliate, coriaceous, leaflets elliptic, elliptic-oblong, ovate-elliptic, or ovate to occasionally suborbicular, apex obtuse and abruptly acuminate, acumen 2–8 mm long, more or less mucronate, base rotund to weakly cordate, midrib impressed above, primary veins of 8–10 pairs, upper surface dark green, glabrous, lower surface dull green, glaucous, pubescence moderately dense, becoming widely scattered with age, trichomes spreading to sub-erect, lamina

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SIDA 9(4): 344–354. 1982.

8–15 cm long, 4–9 cm wide. Petiole reddish-brown, subquadrangular to nearly terete, weakly longitudinally striated, occasionally with a shallow grove adaxially near the apex, 2–7.5 cm, pubescence scattered with uncinate microtrichomes and rufus, subappressed macrotrichomes, becoming glabrate; rachis 1–3 cm, somewhat compressed laterally; petiolules quadrangular, rugose, 5–6 mm. Stipules deciduous, large and conspicuous, lanceolate to oblong-lanceolate, broadly acute, sometimes weakly arcuate, 8–19 mm long, 4–6 mm wide, ciliolate with sparse appressed trichomes on the surface; stipels linear-lanceolate to lanceolate, acute, weakly 5-nerved, 8–13 mm long, 2–3 mm wide, terminal stipels smaller (4–9 mm x 1–2 mm). *Inflorescence* axillary and cauliflorous, 1–4 peduncles per node, dark-colored, subsessile to 0.5 cm long, racemose, few-flowered (1–2, occasionally 3 pairs of flowers), axis pubescence of uncinate microtrichomes with scattered spreading to erect macrotrichomes. Pedicels 4–6 mm with predominately uncinate microtrichomes. Bracts large, 5–8 mm long, 1.5–2 mm wide. Bracteoles large, lanceolate, acute to subacuminate, 9–12 (15) mm long, 3–5 mm wide, inserted 1.5–2 mm below the calyx, pubescence of scattered uncinate microtrichomes. *Flowers* resupinate, large, 6–7.5 cm, pale purple. Calyx pubescence moderately dense, of predominately uncinate microtrichomes with a few, scattered, subappressed macrotrichomes, tube 14–18 cm long, 5–8 mm wide at the base expanding to 9–13 mm wide at the throat, lobes ovate, acuminate, apex rapidly narrowed to triangular acumen one-half the lobe length, 7–11 cm long, 3–5 mm wide at base, ventral lobe 9–13 mm long, 1–1.5 mm wide. Vexillum moderately dense uncinate-pubescent, claw 6–9 mm, blade abruptly curved outward above claw, 3.5–4.5 cm wide. Alae extended well beyond carina by 8–11 mm, blade subfalcate, 17–21 mm long, 7–11 mm wide, claw 19–26 mm. Carina arcuate, 15–18 mm long, 4–5 mm wide, claw 27–33 mm. Stamens diadelphous vexillary stamen coherent near base, tube glabrous, falcate, 39–43 mm long, free filaments 4–6 mm; anthers lanceolate, ca 1.7 mm long, 0.5 mm wide. Gynoecium falcate; gynophore 5–8 mm; ovary 13–17 mm long, 1.2–1.3 mm wide, pubescence white tinged yellowish; style much longer than the ovary, 23–27 mm, bearded, geniculate 2–4 mm from distal end, stigma subcapitate. *Legume* stipitate, base enclosed within calyx lobes, flat, brown, pubescence of uncinate microtrichomes plus scattered, rufus, nearly erect macrotrichomes, valves 8–13 cm long, 10–16 mm wide, beak when persistent, 5–7 mm; dehiscence causing valves to twist one-half to one turn. Seeds brown, smooth, subglobose, face nearly orbicular, slightly compressed, 8–12 mm long, 7–11 mm wide, 4–5 mm thick, 7–9 seeds per pod. Figure 1.

TYPE COLLECTIONS: GUYANA. ESSEQUIBO: locally frequent, scrambler, stems woody, leaves glaucescent beneath, fls. pale purple, cauliflorous, fr. greenish-brown, Kaieteur Savanna, 4 May 1944, *Maguire & Fanshawe 23203* (HOLOTYPE:NY 3107; ISOTYPES: A, F 1280928, K, MO 1371651, U 72863A, US 1950981, VEN 28042).

Fig. 1. Holotype of *Clitoria kaieturensis* (*Maguire & Fanshawe 23203*, NY).

The New York specimen is chosen as the holotype because it is the best representative specimen. It includes leaves, an inflorescence with flowers (a dissected flower within the packet) a fruit still attached to its stipe, and some seeds. All known specimens are from the Kaieteur Savanna, the basis for the specific epithet selected.

The specimens of this species traditionally have been identified as *Clitoria javitensis* or as *C. javitensis* var. *glabra* Sagot. *Clitoria kaieteurensis* is distinguished easily from *C. javitensis* by the smaller fruits with uncinate trichomes, uncinate-pubescent calyx, white-pubescent ovary, a style much longer than the ovary, and the subsessile inflorescence. *Clitoria kaieteurensis* exhibits morphological affinities with *Clitoria sagotii* and with other species previously known as *C. javitensis* var. *glabra*, but now excluded from the *C. javitensis* complex (Fantz, 1981). *Clitoria kaieteurensis* is easily distinguished from these species by the large bracts and stipules, and longer staminal tube. *Clitoria sagotti* and related species *C. coriacea* and *C. tunuhiensis* have short stipules (3–6 mm), short bracts (2–5 mm), narrower bracteoles (1–3 mm), and short staminal tubes (32–39 mm).

2. CLITORIA **pendens** Fantz, *sp. nov.*

Vites lignosi ad 30 m. Folia trifoliata, foliolis ellipticis ad ovato-ellipticis, acuminatis. *Inflorescentiae elongatissimae (12–95 cm), pendulae*, cauliflorae, racemoso-nodoso, *multiflorae. Flores magni, 6–8 cm*, albidi suffusi malvinis. *Bracteolae brevissimae, 3–5 mm. Calyces trichomatibus microuncinatis, tuba 17–24 mm faucibus latis.* Stylus elongatus, 27–33 mm, longitudine ovarium magnopere superantes. Legumen brevistipitatum, planum, trichomatibus microuncinatis praecipue cum dispersis macrotrichomatibus subappressis ad patinibus.

Liana, to 30 m long. *Leaves* 3-foliate, thick-membranous to chartaceous, leaflets elliptic to ovate-elliptic, apex obtuse, abruptly acuminate, acumen 1–2 cm long, mucronate, base broadly cuneate to rotund, midrib weakly raised above, primary veins of 6–8 pairs, concolorous, upper surface glabrous, lower surface glabrate (juvenile with stiff erect hairs), lamina 7–15 (27) cm long, 4–7 (10) cm wide, lateral pair of leaflets occasionally asymmetrical. Petioles subquadrangular to terete, 5–9 (11.5) cm, pubescence sparce to glabrous, trichomes uncinate; rachis (1.5) 2–4 (4.5) cm; petiolules subquadrangular, rugose, 5–6 mm. Stipules deciduous, lance-deltoid, acute, inconspicuously striate, 3–4 (5) mm long, 1 mm wide; stipels deciduous, linear, 3–5 mm long, 0.2–0.8 mm wide. *Inflorescence* usually cauliflorous, pendent, racemose, multiflowered, unbranched or rarely forked near the base, highly elongated, generally 12–45 cm long (bearing flowers) to occasionally 95 cm long (with fruit), nodose; primary lateral branches subsessile to 1–2 mm, rarely to 5 mm long; inflorescence fascicled, inserted mainly near the base of the stem (teste *Maguire 54265*) or terminal and bearing small, deciduous leaves along the base of the inflorescence; axis pubescence dense, of uncinate microtrichomes with some appressed, rufus, macrotrichomes,

and becoming sparsely uncinate towards the base. Peduncles 2–10 cm; rachis internodes 2–15 mm. Pedicels 3–5 mm. Bracts minute, lanceolate, acute, 2–3 mm long, 1 mm wide. Bracteoles short, inconspicuous, narrowly lanceolate, acute, 3–5 mm long, 1.1–2 mm wide, inserted 1 mm below the calyx base. *Flowers* resupinate, large, 6–8 cm, whitish becoming pinkish to pale violet with age. Calyx pubescence of predominately uncinate microtrichomes plus few to sparse, appressed, rufus macrotrichomes, tube green with reddish-purple tinge, 17–24 mm long, 5–8 mm wide at base expanding to 9–15 mm wide at the throat, lobes ovate-deltoid, acute, 6–8 (9) mm long, 4–6 mm wide at base. Vexillum uncinate-pubescent to glabrate; blade abruptly curved outward near the base above the claw, 3.5–5 cm wide; claw 10–15 mm. Alae extended 4–6 mm beyond the carina, blade suboblong-spatulate, 23–27 mm long, 7–10 mm wide, claw 23–26 mm long. Carina arcuate, blade 15–20 mm long, 5–7 mm wide, claw 34–36 mm long. Stamens diadelphous, vexillary stamen coherent near the middle and coherent to free near the base, tube glabrous, weakly arcuate, 40–48 mm long; free filaments 2–6 mm; anthers lanceolate, 2–3 mm long, 0.7–0.8 mm wide, connective apiculate. Gynoecium weakly arcuate; gynophore 5–8 mm; ovary 18–20 mm long, 1.5–1.7 mm wide, pubescence dense, white tinged yellowish; style 27–33 mm, much longer than the ovary, bearded, geniculate 8–13 mm from the distal end; stigma capitate, 0.5–0.7 mm diam. *Legume* short-stipitate, base enclosed by calyx lobes to slightly exerted, flat, pubescence of uncinate microtrichomes with scattered subappressed to spreading macrotrichomes; with scattered subappressed to spreading macrotrichomes; valves 13.5–16 cm long, 10–15 mm wide; stipe 23–31 mm long; beak 4–8 mm; dehiscence not observed. Seeds not observed, ca 7–8 per pod. Figure 2.

TYPE COLLECTION: SURINAM. NICKERIE: Liana, cauliflorous, flowers mainly at base, calyx green and reddish, corolla, lavender, wood yellow, in mesophytic forest, 9 km north Lucie River, 12 km west Oost River, 3°36′ to 3°41′N–56°30′ to 56°34′W, 275 m, 16 Jul 1963, *Maguire et al. 54265* (HOLOTYPE: NY). SURINAM. NICKERIE: hills 9 km N of Lucie River, 12 km W of Oost River, 275 m, 1 Aug 1963, *Irwin et al. 54552* (PARATYPES: F 1615263, GH, MO 1800897, NY, S, U 169942B, US 2447103).

The specimen selected as the holotype is the only specimen examined that has both flowers and fruits. However, this specimen does lack the vegetative structures. A second collection from the same locality, *Irwin et al. 54552*, is selected as a paratype. It has both vegetative and floral structures, some of which are in a dissected state. Both type collections exhibited the characteristic elongated inflorescences. This is the only species in the genus reported to have pendulous inflorescences, hence the specific epithet.

This species has close morphological affinities with *C. leptostachya*. Historically, any liana specimen with very elongated inflorescences and lacking the large bracteoles which hide the calyx was identified as *C. leptostachya*. *Clitoria leptostachya* can be distinguished easily from *C. pendens* by the

Fig. 2. Holotype of *Clitoria pendens* (*Maguire et al. 54265*, NY).

smaller flowers (4–6 cm), narrower calyx tube (7–10 mm wide at the throat), shorter calyx lobes (4–6 mm), longer pedicels (5–7 mm), smaller wings & keel, shorter staminal column (32–37 mm), and shorter style (17–19 mm) which is only slightly longer than the ovary (12–15 mm).

3. CLITORIA SAGOTII Fantz, SIDA 8(1): 94. 1979.

Clitoria javitensis (HBK) Benth. var. *glabra* Sagot, Ann. Sc. Nat. Ser. 6, 13: 299. 1882. (TYPE: *Sagot 120*, K).

Clitoria javitensis (HBK) Benth. var. guianensis Sagot, *nom. in sched.* (TYPE: *Sagot 120*, GH, NY, U, W).

Clitoria prostrata Spruce, *nom. in sched.* (TYPE: *Spruce 3543*, K).

Liana, climbing or occasionally trailing. *Leaves* 3-foliate, coriaceous, concolorous (green), leaflets elliptic-oblong or elliptic to lanceolate, narrow to very broad, apex obtuse abruptly acuminate, acumen 1–2 cm, base cuneate to broadly cuneate, midrib conspicuously raised above, primary veins of 6–11 pairs, both surfaces glabrous, lamina (6.5) 8–21 (25) cm long, 3–8 (13) cm wide. Petiole subquadrangular-terete, adaxially truncate to canaliculate, 1.5–8.5 cm, glabrate to uncinate microtrichomed; rachis 1.5–4 cm; petiolules quadrangular, dark-colored, rugose, 4–9 mm. Stipules deciduous, deltoid-lanceolate, acute, 4–5 (6) mm long, 1.5–2 mm wide; stipels somewhat persistent, linear to lanceolate, acute, 1–6 mm long, 1–1.5 mm wide. *Inflorescence* axillary, solitary, or cauliflorous, fascicled, racemose, few-flowered (2–4 flowers, rarely 6), subsessile to 0.5 cm long; axis pubescence of uncinate microtrichomes. Pedicels 6–11 mm, with uncinate microtrichomes; pedicels of cauliflorous inflorescences compressed, flattened below the bracteoles and 2–3 mm wide. Bracts ovate, obtuse, with uncinate microtrichomes and ciliolate, 3–5 mm long, 1–2 mm wide. Bracteoles linear-lanceolate, acute to short-acuminate, often spreading, 4–11 mm long, 1–2 mm wide, inserted 2–5 mm below the calyx base. *Flowers* resupinate, large, 5–8 cm, vexillum pinkish-mauve with darker-colored veins near the center, alae and carina white. Calyx chartaceous, conspicuously uncinate microtrichomes and scattered subappressed to spreading macrotrichomes, tube 11–16 mm long, 4–7 mm wide at base expanding to 8–13 mm wide at the throat, lobes deltoid-ovate to lanceolate, acuminate, more or less arcuate, 5–13 mm long, 2–6 mm wide at base. Vexillum pubescence of uncinate microtrichomes with scattered appressed macrotrichomes, blade 3–4.5 cm wide, claw 6–9 mm. Alae extended well beyond carina by 8–13 mm, blade spatulate-falcate, 18–23 mm long, 8–12 mm wide, claw 17–26 mm. Carina nearly straight, uncinate microtrichomed, blade 11–18 mm long, 3–6 mm wide, claw 25–35 mm. Stamens diadelphous, vexillary stamen coherent at the base, tube glabrous, arcuate-falcate, 32–39 mm long, free filaments 4–7 mm, anthers lanceolate, 1.5–2.1 mm long, 0.7–0.8 mm wide, connective acute, nearly subequal to anther sacs. Gynophore 2–4 mm; ovary 10–15 mm long, 1–1.3 mm wide, pubescence white tinged yellowish; style 22–26 mm,

dark-colored, much longer than the ovary, bearded, geniculate 8–10 mm from the distal end; stigma capitate, 0.6–0.8 mm diam. *Legume* (known from var. *canaliculata* only) stipitate, exerted above the calyx, flat, pubescence moderate, more commonly borne along the sutures, of uncinate microtrichomes with few, scattered, suberect macrotrichomes; valves 8.5–15 cm long, 15–18 mm wide; stipe straight to weakly arcuate, 27–35 mm long; beak 10–15 mm when persistent; dehiscence causing valves to twist 1–2 turns. Seeds (observed in damaged condition) dark brown to black, smooth, thick, lenticular to subglobular, 6–7 mm long, 6–8 mm wide, 4–5 mm thick, 4–8 seeds per pod. Figure 3.

TYPE COLLECTIONS. FRENCH GUIANA. Frutex alte scandens, flores rosei, suavolentes, plurimi e ligno prodientes, fructum non vidi, Karouany, 1857, *Sagot 120* (HOLOTYPE: K-Hb. Bentham, photo at S; ISOTYPES:GH, NY, S, U, 37632A, W).

This species includes a number of specimens that typically go by the name of *C. javitensis* var. *glabra* Sagot. This group of plants has been excluded (Fantz, 1981) from the broad concept of *C. javitensis* as observed by Bentham (1858), Sagot (1882), and later authors who adopted Sagot's treatment. *Clitoria sagotii* can be distinguished easily from *C. javitensis* by the prominent uncinate microtrichomes on the calyx, legume, and various plant axes, the raised midrib on the upper leaf surface, the subsessile inflorescences, short vexillum claw, and smaller fruits. For a more detailed discussion, refer to Frantz (1981).

This species consists of three distinct varieties, nearly allopatric in distribution.

3a. CLITORIA SAGOTII var. SAGOTII

Clitoria javitensis (HBK) Benth. var. *glabra* Sagot, Ann. Sc. Nat. Ser. 6, 13: 299. 1882. (TYPE: *Sagot 120* K).
Clitoria javitensis (HBK) Benth. var. *guianensis* Sagot, *nom. in sched.* (TYPE: *Sagot 120*, GH, NY, U, W).

Leaflets (12) 15–21 (25) cm long, 5–8 (13) cm wide, primary veins of 8–11 pairs. Petiole 5–8.5 cm long, flattened (truncate) adaxially, without grooves. Flowers large, 6–8 cm. Calyx lobes elongate, 8–13 mm. Bracteole 6-10 mm. Ovary elongate, 13–15 mm.

The typical variety is recognized easily by the larger flowers with elongated calyx lobes and more robust vegetative features. It is known from mountain forests of French Guiana, blooming between December through February.

3b. CLITORIA SAGOTII var. **canaliculata** Fantz, *var. nov.*

Clitoria sagotii Fantz var. *caniculata* Fantz, *nom. in sched.* (err. orthog.)
Varietate novo *Clitoria sagotii* distinguibus ab petiolo canaliculato adaxiali conspicue et bracteolatis brevioribus insertibus base calyci 2–4 mm.

Fig. 3. Holotype of *Clitoria sagotii* (*Sagot 120*, K-Hb. Bentham).

Leaflets (6.5) 8–16 (20) cm long, 2.5) 3–7 cm wide, primary veins of 6–8 pairs. Petiole 1.5–5.5 (7) cm, with a conspicuous shallow to deep longitudinal groove adaxially. Petiolules 4–6 (rarely 7–9) mm. Flowers 5–6.5 (8) cm. Calyx lobes 5–8 mm. Bracteoles 4–6 mm. Ovary 10–22 mm.

TYPE COLLECTION. GUYANA. Vine with woody stems either procumbent in the open or twining up low bushes in secondary wh. sand forest, sandhills, Demerara River, 22 Feb 1943, field no. F 1197, *Forest Dept. British Guyana 3933* (HOLOTYPE: K-sheet labeled no. 2!; ISOTYPES: K-sheet labeled no. 1 not seen, NY!).

This variety is recognized easily by the canaliculate petioles. It is found in sandy soils of savannas and upland woods and thickets in Guyana, Surinam, and rarely in eastern Venezuela. Flowers have been collected from July through March. Fruits have been collected from November through February, with one collection in July.

3c. CLITORIA SAGOTII var. **sprucei** Fantz, *var. nov.*

Clitoria prostrata Spruce, *nom. in. sched.* (TYPE: *Spruce 3543*, K).

Varietate novo *Clitoria sagotii* ad regio occidentali Amazoniacum distinguibus ab floribus parvitibus cum lobibus calyci brevioribus et petiolo acanaliculato.

Leaflets 7–18 cm long, 3–7 cm wide, primary veins of 8–11 pairs. Petiole 2–7 cm long, flattened (truncate) adaxially, without grooves. Petiolules 7–8 mm. Flowers 5–6.5 cm. Calyx lobes 5–8 mm. Bracteoles (6) 7–10 mm long, subtending and inserted 1 (2) mm below calyx base. Ovary 10–12 mm.

TYPE COLLECTIONS: VENEZUELA [?]. AMAZONAS: AC. Tomo fl. Guaimie, ubi in graminosis sylvanum humiliorum gregarie viget, 18 Aug 1854, *Spruce 3543* (HOLOTYPE; K-Hb. Bentham). VENEZUELA: Ad flum. Guainiá v. Rió Negro supra ostium fluv. Casiquairi, 1854, *Spruce 3543* (PARATYPES: G 195 & 196, GH, CGE-Hb. Lindley, F 1546829, W 112030, RB 17245). BRAZIL. AMAZONAS: prope San Carlos, ad Rió Negro Brasilia borealis, 1853-4, *Spruce 3543* (PARATYPES: BM, K-Hb. Bentham, W 18666).

Spruce 3543 includes three sets of data, yet all plants were collected within a small geographic area and recognized by Spruce as one species. The holotype selected is the only one bearing Spruce's manuscript name of *Clitoria prostrata*, the probable original collection of the three sets placed under one number by Spruce.

This variety lacks the conspicuous canaliculate petioles of var. *canaliculata* and bears smaller flowers and calyx lobes, distinguishing it from var. *sagotii*. The species is widely distributed in woods or open areas in the western Amazon basin, in western Brazil, southern Venezuela, and rarely in southern Colombia. Flowers have been collected in August, November, and April through June.

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VEGETATIVE APOMIXIS ('VIVIPARY') IN *BOUTELOUA HIRSUTA* LAG. (POACEAE)

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Vegetative apomixis in the inflorescences of various angiosperms is well-known. The summaries of Stebbins (1941), Gustafsson (1946, 1947), and Nygren (1954) list 44 taxa known to show this reproductive mechanism, 3 of which are dicots, 17 are grasses, and 24 are other monocots (particularly *Agave* and *Allium*). The production of asexual bulblets (or plantlets) on a parental individual is often mistakenly called 'vivipary', a term best reserved (in botany) for the process whereby seeds germinate while the fruit is still held by the inflorescence. In vegetative apomixis some portion of the inflorescence itself develops into buds, bulblets, or proliferations (Stebbins, 1941).

The hairy grama grass, *Bouteloua hirsuta* Lag., is a frequent component of the prairies of the United States and Mexico, ranging from North Dakota to Wisconsin, south to California and Mexico, and east to Louisiana and peninsular Florida. In July, 1981 two unusual populations were observed on the coastal prairie of Texas as follows: REFUGIO CO.: open coastal prairie 1.5 mi SE of Willow Lake, Willow Lake Pasture, Greta Ranch, ca 8 mi NE of Refugio, 15 Jul 1981, *S. R. Hill 10501* (COLO, GH, MARY, MO, NMCR, NY, TAES, VT); short grass prairie remnant, south side of hwy 77, House Pasture, Greta Ranch, 8 mi NE of Refugio, 19 Jul 1981, *S. R. Hill 10570a* (GH, MARY, TAES, VT). Their spikes bore numerous and conspicuous green plantlets in place of normal greyish spikelets. I had not encountered such plants previously during a four year vegetation study of the area.

Vegetative apomixis in *Bouteloua hirsuta* was briefly mentioned by Gould (1968, p. 72) and by Gould and Box (1965, p. 36), the latter of which states: "The plants of our area frequently are viviparous in the early summer." However, the authors did not provide an illustration nor information on what structures were involved, both of which are provided in this paper. The monograph on *Bouteloua* and related genera by Griffiths (1912) made no reference to vegetative apomixis.

Gametophytic apomixis, specifically apospory, has been reported in *Bouteloua curtipendula* (Michx.) Torr. by Mohamed and Gould (1966) but this process has not been found in *Bouteloua* section *Chondrosioides* to which *B. hirsuta* belongs. Vegetative apomixis has not been reported for the inflorescences of any other species of *Bouteloua*.

SIDA 9(4): 355–357. 1982.

Fig. 1. *Bouteloua hirsuta* Lag. a). habit, inflorescence with plantlets replacing spikelets, line-scale = 1 cm (*Hill 10570a*); b) normal spikelet, lateral view; c) vegetative spikelet, second glume and first lemma; d) mature plantlet in spikelet; e) detail of plantlet base and fertile floret. (b-e, line-scale = 1 mm; *Hill 10501*).

The normal spikelet bears two glumes (the second of which often has tuberculate bristle-hairs), a fertile floret, and a sterile floret (Fig. 1, b). The lemma of the fertile floret has a trifurcate apex with awns, and encloses the unornamented bicarinate palea. The sterile floret or rudiment is a stipitate lemma with three well-developed awns. In the present case (Fig. 1, a) only the floral bracts within the individual spikelet are transformed. Young plantlets or bulblets are seen in spikelets throughout the inflorescence. The older spikes of the season often bore both normal spikelets with mature fruits and atypical spikelets with well-developed plantlets. However, in younger spikes there were no normal spikelets, but only transformed spikelets in which the lemma of the fertile floret was green, elongated, and bore tuberculate hairs more typical of vegetative portions of the plant (Fig. 1, c). In these spikelets the palea was rudimentary and green, and the rudiment itself was absent and, therefore, not involved. The mature plantlets in the older spikes were seen to have originated totally from the rudiment (Fig. 1, d-e), and in each spikelet the fertile floret often bore a mature fruit.

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A NEW THREE-AWN GRASS FROM TRANS-PECOS, TEXAS

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ARISTIDA **brownii** Warnock, sp. nov.

Gramina perennia caespitosa 60–100 cm alta fere glabra; foliosa in parte tertia basali; folia omnio valde involuta 14–25 cm longa arcuata; inflorescentiae spiciformes terminales ca 20 cm longae ramulis adpressis; spiculae (aristis exclusia) 8–11 mm longae; fluma infera arista brevi inclusa ca 8 mm longa; gluma supera 8–10 mm longa exaristata; lemma callo brevi, corpore 8–10 mm longo, columella ca 2 mm longa debile torta, arista centrali ca 8–10 mm longa, artistis 2 lateralibus ca 1–2 mm longis.

Tufted perennial; stems erect to ascending, 60–100 cm tall mostly appearing glabrous, old culms have a tendency to shred; inflorescence spicate panicle ca 20 cm long, appressed branches; peduncle long exserted ca 15–45 cm; leaves more abundant on lower one-third of plant; blades micro-scabrous on upper surface ridges, tightly involute and curving ca 14–25 cm long, ca 1.5 mm broad at base, pilose to glabrous near throat; ligule short hairs ca 0.4 mm long; collar glabrous; sheaths short ciliate on margins at throat, micro-scabrous on ridges; spikelets 1–10 per appressed branches, 8–11 mm long, excluding once geniculate awn; first glume ca 8 mm long including short awn; second glume 10–11 mm long, awnless; lemma body glabrous ca 10–11 mm long to beak or column which is slightly twisted, ca 2 mm long two lateral awns ca 1–2 mm long but vary somewhat in length; central awn ca 8–10 mm long, micro-scabrous; callus short pubescent.

TYPE COLLECTION: TEXAS. Brewster Co.: widespread perennial on limestone hills of Del Norte Mountains, elevation 4600 feet or more, 27 Jun 1981, *Warnock 141* (HOLOTYPE: Lajitas Museum; ISOTYPES: TEX, SMU).

This three-awn grass is known only from Del Norte Mountains; of minor importance for forage except prior to anthesis. Named for Joseph R. Brown who practices good conservation on his Altuda Mountain ranch. I am deeply indebted to Dr. Marshall Johnston, U.T. Austin for translating my English description of this taxon. Dr. Johnston states that he has seen several species of *Aristida* in Mexico that show considerable variation in length of the lateral awns. The habitat and general appearance of this grass closely resembles *Aristida Wrightii* which is frequent and in close association with this taxon.

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Figure 1. *Aristida Brownii.* A. Habit, X 1/2; B. Spikelets, X 13; C. Callus, upper and lower surface X 7.

PUCCINELLIA DISTANS (JACQ.) PARL. (POACEAE): A HALOPHYTIC GRASS RAPIDLY SPREADING IN OHIO

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Puccinellia distans (Jacq.) Parl. (alkali grass; reflexed saltmeadow grass) is an Eurasian perennial grass of exposed halophytic situations which has been established locally in the United States since at least the late nineteenth century. It is widespread in the western states and along the northeastern Atlantic Coast with scattered interior stations from southern Ontario to Wisconsin and Illinois (Fernald, 1950; Gleason & Cronquist, 1963; Hitchcock & Chase, 1951; Mohlenbrock, 1975). Although first collected in Ohio in 1963, only in the past ten years has *Puccinellia distans* become common. It has spread rapidly across the state, apparently because of its ability to survive and flourish in salt-rich environments. A review of its advance and occurrence in Ohio may serve as a model for other midwestern states.

Most manuals give the species authorities for *Puccinellia distans* as (L.) Parl., but (Jacq.) Parl. would seem to be correct (E. G. Voss, pers. comm., 1982). Reference works using (Jacq.) Parl. include Dore & MacNeill (1980), Kartesz & Kartesz (1980), and Voss (1972). The Ohio plants can be determined as the var. *tenuis* (Uechtritz) Fern. & Weath. (Fernald & Weatherby, 1916).

Pucinellia distans first was collected in Ohio in 1963 from a rest area along Interstate 75 in Butler County (*Weishaupt s.n.*, OS 74517). This collection is the sole record for the state cited by Weishaupt (1967). Only one other collection is known to exist from Ohio in the 1960's, a specimen sent to The Ohio State University Agronomy Department for identification in 1968. The grass had been collected in Seneca County "in a seeding of Kentucky Bluegrass" (OS 86162).

The mid 1970's saw a dramatic increase in the number and extent of populations of *Puccinellia distans* in Ohio. At this time Weishaupt noted the establishment and spread of this species along Interstate 70 in central Ohio west of Columbus (pers comm., 1981). As of 1981, alkali grass had been collected from 35 Ohio counties, almost all of the collections being from the corridors of interstate highways (Fig. 1).

When in flower *Puccinellia distans* is quite conspicuous, forming a pinkish band paralleling the roadway virtually adjacent to the pavement. Species frequently associated with *Puccinellia distans* include *Anagallis arvensis* L.,

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Carex praegracilis W. Boott, *Spergularia marina* (L.) Griseb., and *S. media* (L.) C. Presl *ex* Grieseb. *Hordeum jubatum* L. is common in the same situations, but grows slightly further from the pavement. This zonation can be very striking, the outer band of *Hordeum* bordering an inner band of *Puccinellia* along the verge. The associated species mentioned above are in both zones with the exception of *Carex praegracilis*. This species occurs only in the *Puccinellia* zone.

Among states and provinces adjacent to Ohio, *Puccinellia distans* has been reported only from Michigan, Pennsylvania, and Ontario. Voss (1972)

Fig. 1. *Puccinellia distans* (Jacq.) Parl., Ohio county distribution, 1981.

lists this species from six counties of southwestern Michigan, although not from counties bordering Ohio. In Michigan, an association of halophytic species, including *Puccinellia distans*, is described by Reznicek (1980). This site is along an interstate highway and rather similar to, though floristically more diverse than, many of the plant's habitats in Ohio. Alkali grass has been reported only from southeastern Pennsylvania (Wherry, et al., 1979). The species has been known in Ontario since 1879 and now is scattered widely across southern Ontario (Dore & MacNeil, 1980). Though not reported from Indiana (Deam, 1940) or western Pennsylvania, *Puccinellia distans* may be expected to occur in these areas. The species doubtless is present there and may be merely overlooked.

Speculating on the mode of introduction of *Puccinellia distans* in this region, Dore & MacNeill (1980) indicate that it may be a contaminant in the grass mixtures used to seed highways. The 1968 collection cited above was from a seeding of bluegrass, but it would not seem to be a likely source of the many populations in Ohio.

Of equal interest is the rapid advance of the species in recent years across Ohio. This spread must be related directly to the use of road de-icing salt. The verge environment is not saline at first, of course, but gradually the salt accumulates in the soil creating a desert-like situation which few species can tolerate. *Puccinellia distans* seems to be at a great competitive advantage in this salt-rich zone. The advance of alkali grass in Ohio must not be unique to the state, but probably is typical of those states where de-icing salt has been applied repeatedly through time. Given its ability to flourish in such a hostile environment and the widespread occurrence of that environment, *Puccinellia distans* is likely to become a significant member of the spontaneous vascular flora of the Mideast.

ACKNOWLEDGEMENTS

Specimens used in the study are housed at CLM, KE, MU, and OS. I thank the curators of these herbaria for their assistance and courtesy. I gratefully acknowledge advice and information given me by Dr. Edward G. Voss, University of Michigan Herbarium, and Dr. Clara G. Weishaupt, Fairborn, Ohio. My research was supported by the Ohio Department of Natural Resources, Division of Natural Areas and Preserves.

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DALEA CANDIDA MICHAUX EX WILLDENOW (FABACEAE) NEW TO THE RIDGE AND VALLEY PHYSIOGRAPHIC PROVINCE

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ABSTRACT

Dalea candida has been collected from the Ridge and Valley Physiographic Province in Meigs County, Tennessee and Catoosa County, Georgia. This is the first report of the species from eastern Tennessee, Georgia and the Ridge and Valley Physiographic Province.

Dalea candida (Michaux) Willdenow var. *candida* (= *Petalostemon candidum* Michaux) is an erect, herbaceous, perennial legume that is widely distributed throughout the tallgrass prairie region of central North America, and it also is known from several states in the southeastern United States. The reported geographical range of the taxon is from southern Manitoba and Saskatchewan, south to Texas and Louisiana and eastward to Wisconsin, Indiana, central Kentucky, central Tennessee and eastern Alabama (Wemple, 1970; Barneby, 1977). According to Wemple (1970), it occurs primarily in ". . . prairie habitats, open woodlands and glades, occasionally adventive along railroads." Weaver (1954) lists it as one of the "principle forbs of upland prairie," and Steyermark (1963) gives it habitat in Missouri as ". . . prairies, rocky open glades, along railroads and rocky or open woodland."

The range of the other segment of *Dalea candida, Dalea candida* Michaux ex Willdenow var. *Oligophylla* (Torrey) Shinners (= *Petalostemon occidentale* (Gray ex Heller) Fernald), is mostly west of that of var. *candida*, with some overlap occurring in the central North American grassland region (Isely and Welsh, 1960; Wemple, 1970).

On 22 June 1981 while botanizing in cedar (limestone) glades in the Ridge and Valley Physiographic Province in Meigs County in eastern Tennessee and in Catoosa County in northwestern Georgia, we discovered a population of *D. candida* var. *candida* in each of the two counties (Fig. 1). The population in Meigs County occurred at the edges of a small cedar glade and adjacent open deciduous woodland just north of Eastview School (J. & C. Baskin # 1985). We counted about 200 plants in this population. The population in Catoosa County, Georgia occurred in a small glade-like opening and extended along the rocky roadside of Viniard-Alexander Road through an open deciduous woodland in the Chickamauga and Chattanooga

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National Military Park (J. & C. Baskin # 1986). There were about 25 plants at the site. Fig. 1.

Dalea candida previously has not been reported from eastern Tennessee (Mahler, 1970; Collins *et al.*, 1978), Georgia (Duncan and Kartesz, 1981; Van Horn, 1981) or the Ridge and Valley Physiographic Province (Wemple, 1970; Barneby, 1981). In Tennessee, *D. candida* previously was thought to be restricted to Davidson, Rutherford and Wilson counties in the Nashville Basin of Central Tennessee (Collins *et al.*, 1978; Mahler, 1970), and in northern Alabama Wemple (1965) cites it only from Colbert County in the northeastern part of that state. Thus, the populations in the Ridge and

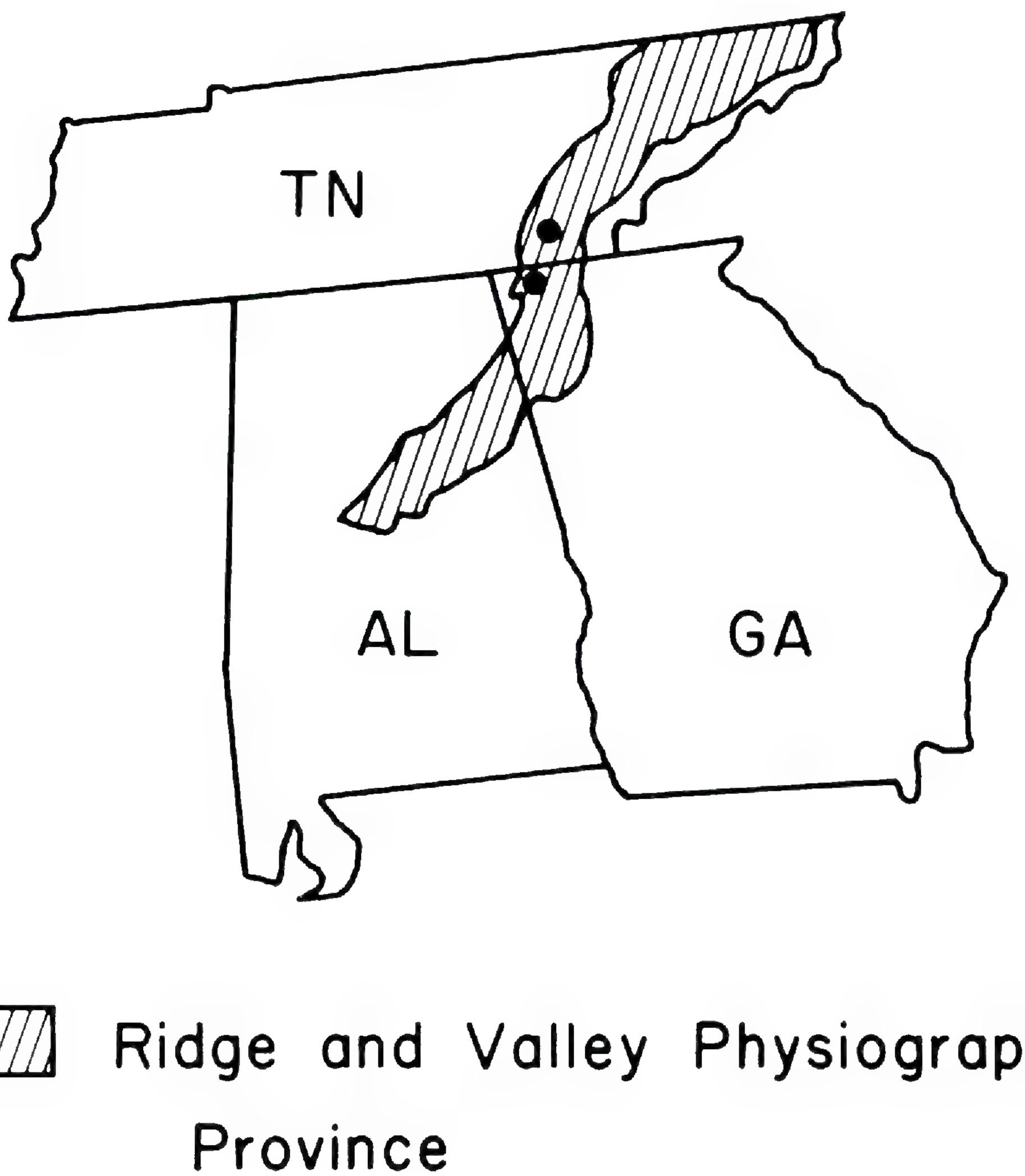

Figure 1. Presently known locations of populations of *Dalea candida* (dots) in the Ridge and Valley Physiographic Province. The dots are in Meigs County, Tennessee and Catoosa County, Georgia.

Valley Physiographic Province of Georgia and Tennessee represent significant eastward range extensions of this taxon.

Interestingly, the cedar glade flora of northwestern Georgia contains several prairie species that are at the southeastern limit of their range and are characteristic of prairies and glades to the west and northwest. These species include: *Bouteloua curtipendula* (Michaux) Torrey, *Sporobolus heterolepis* Gray, *Aster sericeus* Ventenant and *Onosmodium molle* Michaux var. *occidentale* (Mack.) I. M. Johnston. *Dalea candida* var. *candida* is another addition to this western prairie element.

Voucher specimens of *D. candida* var. *candida* have been sent to VDB and SMU.

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NOTES

RHYNCHOSPORA MILIACEA AND *SCIRPUS DIVARICATUS*, NEW TO TEXAS—*Rhynchospora miliacea* (Lam.) Gray is a stoloniferous perennial beak-rush inhabiting the Coastal Plain from southeast Virginia to southern Florida and west to Louisiana (Godfrey and Wooten, 1979). It is found in floodplain forests, swamps, wet woodlands and along marshy shores of streams. Its only known occurrence in east Texas is on a wooded slope with springs and seepages. The slope is affiliated with Clear Fork Creek just north of its junction with Highway 256 in Tyler County. It was initially collected in September, 1980 (*Nixon and Ward 10671* ASTC).

Scirpus divaricatus Ell. was found 14 Nov 1980 northeast of Silsbee within the Jack Gore Baygall Unit of the Big Thicket National Preserve in a wet pond-like area (*Nixon and Ward 10906*). It is generally found in low wet woods and swamps from Virginia to Florida, west to Louisiana, thence to Missouri (Godfrey and Wooten, 1979)—*Elray S. Nixon and John R. Ward, Biology Department, Stephen F. Austin State University, Nacogdoches, TX 75962-3003.*

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PSILOCARYA SCIRPOIDES TORR. (CYPERACEAE) AND *PHYSALIS MISSOURIENSIS* MACKENZ. & BUSH (SOLANACEAE) NEW TO LOUISIANA.—Continued field work on the Louisiana flora has produced collections of two additional unreported taxa.

PSILOCARYA SCIRPOIDES Torr. LOUISIANA. Washington Parish: abundant in wet ditch along edge of low woods near Scarborough Creek No. 3 ca 1.3 mi S of Angie on LA 21, 30 Sep 1979, *Allen & Vincent 9697* (LAF). The previously known range of this taxon is indicated by Godfrey and Wooten (1979) as extending in the costal plain from Massachusetts to North Carolina, the Florida panhandle, and in the Great Lakes Lowland, with a more recent record from Alabama given by Kral (1981). Duplicates have been sent to GA, MO, NLU, NO, NY, SMU, and VDB.

PHYSALIS MISSOURIENSIS Mackenz. & Bush. LOUISIANA. Lafayette Parish: Infrequent in disturbed area by Biology building on USL campus in Lafayette, 16 Jul 1981, *Allen 11104* (LAF). Compared with other Louisiana species of *Physalis*, this species is distinct in having the calices villous with simple, septate trichomes. Insomuch as the plants were growing in an area that is periodically mown, the species may not persist at this locality. Waterfall (1958) gives the previously known range of this taxon as Missouri,

northeast Kansas, western Arkansas, and adjacent Oklahoma, with a doubtful specimen from southwest Texas. A duplicate is being sent to NLU.—*Charles M. Allen, Division of Sciences, Louisiana State University at Eunice, Eunice, LA 70535, and Karl A. Vincent, Department of Biology, University of Southwestern Louisiana, Lafayette, LA 70504.*

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CHLORIS SUBMUTICA (POACEAE) IN TEXAS.—A collection of *Chloris submutica* H.B.K. (*Worthington 3285*; UTEP, TEX) from the Davis Mountains, Jeff Davis County, Texas, represents the first record of this essentially Mexican grass from the state and may represent the only extant population in the United States. The locality is an open flat area along Limpia Creek at the McGuire Ranch ruins (30°37′30″N–104°05′30″W), 1740 m elevation, and was found there on 2 Sep 1978 and recollected on 16 Aug 1979 to disperse to additional herbaria (*Worthington 5001*; COLO, SRSU, TAES). The species has been extensively collected in Mexico primarily at elevations of 914–1829 m, from as far south as Colombia and Venezuela, and was known from the United States only from old collections from Las Cruces, Dona Ana County, New Mexico (Anderson, D. E., Taxonomy of the genus *Chloris* (Gramineae). BYU Sci. Bull. 17(2): 1–133. 1974). I thank Dr. Dennis E. Anderson for making the determination.—*Richard D. Worthington, Department of Biological Sciences, The University of Texas at El Paso, El Paso, TX 79968.*

GALIUM DIVARICATUM (RUBIACEAE), NEW TO MISSOURI.—During a field trip near Big Creek about 4 miles southeast of Blairstown (Henry County, Missouri), a small herbaceous member of the Rubiaceae was found growing among loose gravel on an abandoned railway bed. The colony was several meters long and as wide as the railroad bed. Specimens collected were easily assigned to the genus *Galium*, but they did not resemble any of the other known species previously recorded for Missouri.

A duplicate specimen has been identified as *G. divaricatum* Poiret ex Lamarck by Lauramay T. Dempster of the Jepson Herbarium (Univ. of California at Berkeley). This species is a naturalized European introduction into North America. Excluding Missouri, it ranges from Ohio and West Virginia, south to Georgia, and west to Arkansas; in addition, it is found

in California and Oregon (C. A. Lawson. 1982. pers. comm.).

A brief description of the Henry County specimens follows: plants annual, sprawling, up to 35 cm tall; leaves in whorls of 5–7, linear; 3.5–7(10) mm long and 0.3–0.7 mm wide with spinulose margins and terminating in a bristle-tip; stems retrorsely scabrous; flowers whitish-green, about 0.7–0.9 mm long, in loose cymes, these branching from the upper axils; fruits roughened in short striate bands.

G. divaricatum is characterized by granular-roughened to glabrous ovaries and fruit, while those of its closet relative, *G. parisiense* L. (*sensu stricto*) has hispid ovaries and fruits. *G. divaricatum* can be treated as an extreme form of *G. parisiense*, as var. *leiocarpum* Tausch (Kartesz, J. T. and R. Kartesz. 1980. A Synonymized Checklist of the Vascular Flora of the United States, Canada and Greenland. Univ. of N. Carolina Press, Chapel Hill. 498 pp.) or var. *divaricatum* (Lam.) DeVis (Hitchcock, C. L. et al. 1959. Vascular Plants of the Pacific Northwest, Part 4. Univ. of Wash. Press, Seattle. 510 pp.). In any case, none of these taxa have been previously recorded for Missouri.

In Missouri, if one uses the Flora of Missouri (J. A. Steyermark. 1963. Iowa State Univ. Press, Ames, Iowa. 1720 pp.) it might be confused with *G. concinnum* T. & G., but *G. concinnum* has larger leaves, 1–2 cm long, cuspidate leaf tips rather than bristle-tipped, and is a perennial with more or less glabrous stems.

Voucher specimens of *Castaner 5831* (Missouri, Henry Co., 25 Jun 1979) have been deposited in the herbaria of Central Missouri State University (WARM) and Southwest Missouri State University (SMS).—*David Castaner, Herbarium, Central Missouri St. Univ., Warrensburg, MO 64093.*

TILLANDSIA RECURVATA (BROMELIACEAE) IN PENSACOLA, FLORIDA—A BOTANICAL CURIOSITY.—Late in autumn 1980 I discovered a small colony of *Tillandsia recurvata* L. growing on the trunk of a cabbage palm (*Sabal palmetto* (Walt.) Lodd) in an ornamental planting in front of a department store at 1412 W. Fairfield Drive, Pensacola, Florida. The *T. recurvata* plants were ca 12 ft above ground level, and the cabbage palm was obviously a transplanted specimen (the natural range of *S. palmetto* in Florida extends only as far west as Gulf County (Kurz and Godfrey, 1962)). Without doubt the *T. recurvata* was unintentionally transplanted along with the cabbage palm when it was brought into Pensacola, which may have been as long ago as 1969 when the nearby Woolco store first opened, but it is also possible that the tree was planted more recently.

Examination of exsiccata at the herbaria of Florida State University (FSU) and the University of Florida (FLAS) show that *T. recurvata* occurs naturally in the following Florida counties: Alachua, Brevard, Broward,

Charlotte, Citrus, Collier, Columbia, Dade, De Soto, Duval, Flagler, Glades, Hendry, Hernando, Highlands, Hillsborough, Indian River, Lake, Lee, Levy, Manatee, Marion, Martin, Okeechobee, Orange, Osceola, Palm Beach, Pasco, Pinellas, Polk, St. Lucie, Sarasota, Seminole, Sumter, and Volusia. Thus the *T. recurvata* observed in Pensacola (Escambia County) is 245 miles west of the nearest natural Florida population.

Outside of Florida, *T. recurvata* has been reported from East Baton Rouge Parish (Piehl, 1974) and an unspecified site in southwestern Louisiana (Thieret, 1969), southwestern Texas from Brewster County east to Blanco, Hays, and DeWitt Counties (Correll and Johnston, 1979), and Arizona (Harlan, 1970), in which it is the only bromeliad. Its natural range extends south through the West Indies, Mexico, and Central America to northern Argentina and Chile (Correll and Johnston, 1979; Smith and Wood, 1975).

To determine if *T. recurvata* could withstand winter conditions of Pensacola, I postponed collecting it until 19 Sep 1981, at which time it was vigorously healthy and in fruit. Thus, unprotected *T. recurvata* had withstood one of Pensacola's severest winters (1980–1981) without evident harm. One specimen (*Burkhalter 7926*) was prepared and deposited in the herbarium of the University of West Florida, Pensacola (UWFP).

My observations indicate that it is possible for *T. recurvata* to exist in Escambia County, Florida. However, until such time as a naturally-occurring population is discovered there, the occurrence of fortuitously-transplanted individuals of *T. recurvata* maintaining themselves in Pensacola without assistance or attention by man must be considered as nothing more than an interesting botanical curiosity.—*James R. Burkhalter, 788 Deedra Avenue, Pensacola, FL 32504.*

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BELLARDIA TRIXAGO (L.) ALL. (SCROPHULARIACEAE) ADVENTIVE IN TEXAS—Specimens are received frequently at the SMU Herbarium for identification. In June 1980 Geyata Ajilvsgi sent a specimen

that was different from anything she had even seen. It appeared at first to be *Parentucellia viscosa* of the Scrophulariaceae, an Old World species adventive in northern California and eastern Texas, but a literature and herbarium search indicated that it was not *P. viscosa* but yet another introduced "Scroph," *Bellardia trixago* (L.) All., with a similar distribution pattern.

Bellardia is regarded as native to the Mediterranean region (Hemsley & Skan, 1905; Munz, 1959) and South Africa (Davis, 1978). It is now colonized in Caucasus, N. Iraq, N. & W. Iran, Cyprus, Turkey, Palestine, Réunion, Ethiopia and E. Africa. It is also found in Australia and N. & S. America where it has been introduced and now naturalized.

Bellardia trixago is a viscid-pubescent annual belonging to the tribe Pedicularieae-Scrophulariaceae. It is similar and closely related to *Bartsia* and *Parentucellia*, other genera of the tribe. Unlike *Bellardia*, *Bartsia* is perennial; *Parentucellia* differs in that the corolla is yellow and the calyx lobes are equal and lanceolate, while in *Bellardia* the corolla is white-lavender and the calyx lobes are unequal and obtuse (Fig. 1).

The earliest report of *Bellardia trixago* for North America appears to be that of Greene (1894) in California: "plentiful in an old field near Martinez, and escaping to the uncultivated slopes adjacent." Abrams (1951) and Munz (1959) reported the species as being naturalized in old fields and grassy places in counties about San Francisco Bay.

The species was first discovered in Texas by the co-author in 1980. The following spring (1981) additional collecting and field work were done to better determine the overall distribution.

HABITAT AND DISTRIBUTION

Collections of *Bellardia* were made in Navarro County of the Blackland Prairie along roadsides, where the species was conspicuous and beautiful, in open fields, and in pastures. Plants were more abundant along roadsides and associated with lighter textured soils on the uplands. The habitat and populations indicate that *B. trixago* is adventive in the area. Figure 2 gives detailed locations of populations observed and collected. Adjacent areas in Navarro and Freestone counties were searched for several miles and no plants were found. The largest colony was just west of Winkler where the plants extended to the Freestone County line and abruptly stopped.

Specimens examined (SMU): TEXAS. Navarro Co.: open pasture ca 11 mi SE of Corsicana, 19 Jun 1980, *Ajilvsgi s.n.*; same location, 15 Apr 1981, *Lipscomb 3351*, *Ajilvsgi 8127*; roadside ca 7 mi S of Kerens on FM 309, 15 Apr 1981, *Lipscomb 3351*, *Ajilvsgi 8128*; roadside and pasture ca 5 mi SE of Corsicana on hwy 287, 15 Apr 1981, *Lipscomb 3356*; roadside ca 7 mi S of Kerens on FM 2859, 15 Apr 1981, *Lipscomb 3355*; roadside ca 0.5 mi W of Winkler on FM 416, 16 Apr 1981, *Ajilvsgi 8129, 8130*.

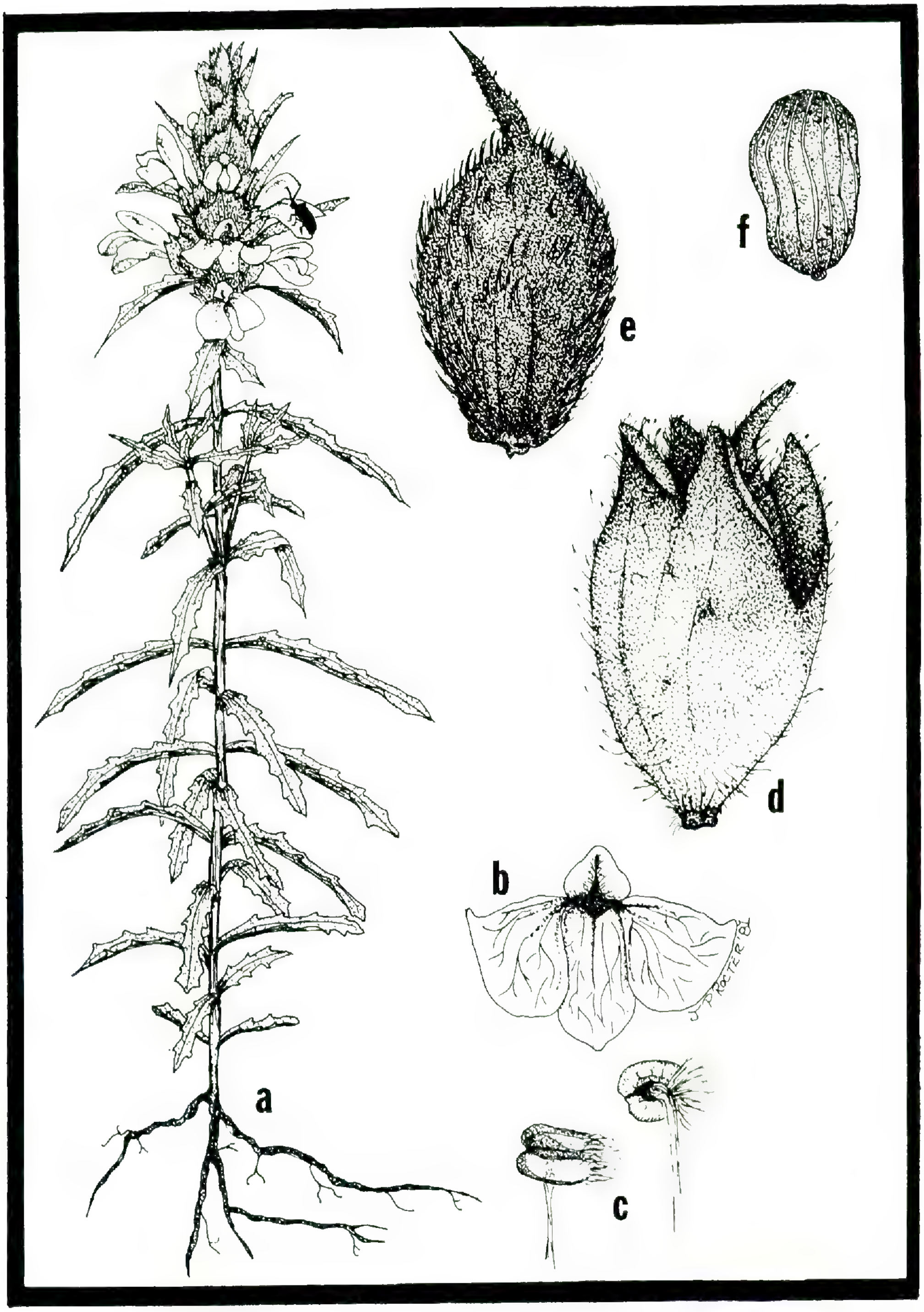

Figure 1. *Bellardia trixago*. a. habit, b. front view of flower, c. anthers, d. calyx enclosing capsule, e. capsule, f. seed.

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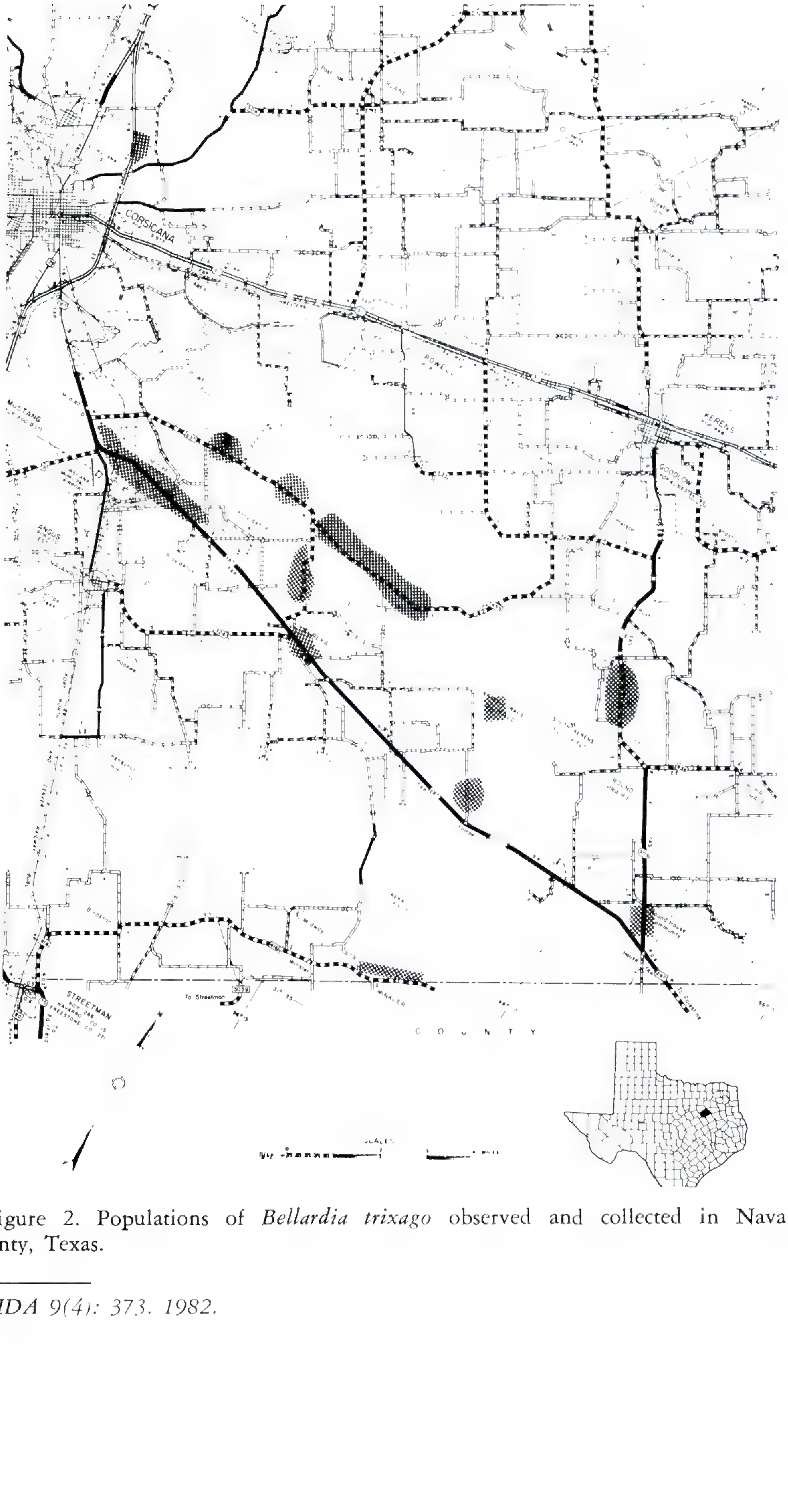

Figure 2. Populations of *Bellardia trixago* observed and collected in Navarro County, Texas.

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REVIEWS

ACTA BOTANICA ACADEMIAE SCIENTIARUM HUNGARICAE, Volume 27, numbers 1-2, 1981, pp. 1-280. (Eighteen papers, 7 of particular interest to Systematic Botanists. Xylotomic study of some woody plant species from Cuba, III, K. Babos and A. Borhidi; Rubiáceas Cubanas, I.—*Randia* L. y *Shaferocharis* Urb., A. Borhidi; *Iris* classification on the basis of generative characteristics, E. Melkó; Mosses of Vietnam, II, Tr. Ninh; *Noguchiodendron*, a new genus of the moss family Neckeraceae, Tr. Ninh and T. Pócs; Studies on African Calymperaceae, III. Conspectus of the African species of *Syrrhopodon* Schwagr, S. Orbán; *Monoclea forsteri* Hook. in Cuba, D. Reyes Montoya).

JOURNEY TO MEXICO DURING THE YEARS 1826 TO 1834. Berlandier, Jean Louis. Translated by Sheila M. Ohlendorf, Josette M. Bigelow, and Mary M. Standifer. Introduction by C. H. Muller. Botanical notes by C. H. Muller and Katherine K. Muller. Austin: Texas State Historical Association, 1980. Pp. xxxvi + 672. Illustrations, appendices, bibliography, index. Two Volumes. $75.00.

"I purchased it because it's too valuable to general science to let it remain and rot in Matamoros," wrote Lieut. Couch from Brownsville to Spencer Fullerton Baird at the Smithsonian in February, 1853. Darius Nash Couch (1822-1897), "a distinguished officer and explorer of the Western Country," had learned of the *reliquiae* of the naturalist Jean Louis Berlandier who had drowned less than two years before. His horse had floundered crossing the Rio San Fernando south of Matamoros en route to Mexico City. Berlandier at age twenty two had arrived at Panuco, Mexico, December 15, 1826 to collect naturalia on behalf of the Swiss botanist, the elder A. P. de Candolle, and a small group of associates. An apprentice of de Candolle at Geneva, Berlandier had contributed to that great *opus*, the *Prodromus*, the earliest nineteenth century account of the world's flora. Less than a year after arriving in Mexico for de Candolle, Berlandier accepted, probably too soon, an appointment as a member of the Commission of Limits, organized by the then infant Republic of Mexico to collect information concerning the country's resources. General Mier y Teran was head of the Commission, which was dissolved sometime in November 1829.

But let Lieut. Couch tell it, as he related his experience with Berlandier's widow to Baird in two letters, 1853-54, as published in W. H. Dall's life of Baird (1915, 295):

> "Berlandiére then settled in Matamoros as a physician, where he was universally beloved from his kind amiable manner and regard for the sick poor of that city, being always ready to give advice and medicine to such without pay.
>
> "He followed a very general custom in that country, living with a woman as his Mistress, but married her a short time before his death. The result of this

connexion was several children—one of them being a Captain of Mexican Infantry." Couch continues:

"Berlandiére made many excursions into the country for the purpose of collecting in Botany, Nat. History, Mineralogy, &c., &c. Also, to make Astronomical and Meteorological observations; the latter made at Matamoros very complete and extensive—his Mss. show that he was also a thorough Geographer and Statistician.

"I have been three times to see Senora Berlandiére's collection, they ask me $1500. I told her of the offer from the Institution but she did not seem to assent to that at all. . . . Today the Senora sent me word that I might have the collection for what I offered $500. . . . Well, I shall probably take it. The payment will cramp me a little, and delay my departure into the interior. . . . The collection is a labor of 24 years and ranges from the Sabine to California. There are about 150 bottles or diff. sizes, diff. species of vertebrata, mostly snakes, lizards, etc.—a few birds; several cubic feet of minerals; a box of plants, some twelve square feet of insects nicely preserved in glass cases; paintings of all the different Indian tribes in Old Mexico; Sketches of Mex. scenery, meteorological reports, observations, with piles of manuscripts relating to his labors. It's very valuable, probably been abused somewhat."

These handsome volumes are the latest and most important literary results from those "piles of manuscripts" inventoried at the time of the Couch purchase. This Berlandier record of early Texas nicely complements leading natural history journals of the period: Kalm's for Delaware-New Jersey, Nuttall's for Arkansas, Bernard Karl, Duke of Saxe-Weimar-Eisenach's on Mississippi Valley. We miss the eloquence of a William Bartram. Berlandier reminds us rather of Venegas writing of aboriginal Baja California. In 1969 John C. Ewers of the Smithsonian published a 209-page *The Indians of Texas in 1830* which included selections from the first English translation of Berlandier's notes, color plates done under his supervision, and illustrations of tribal artifacts. Ewer wrote that "in the future Berlandier may be remembered as one of the most enlightened and most objective amateur ethnographers of the American West during the frontier period."

Merely a hint of the extent of the Berlandier treasure was suggested in Couch's letter to Baird. What bearing, if any, Baird's naming the kingbird *Tyrannus couchii* or the Mexican jay, *Cyanocitta couchii* in 1858, both taken in Nuevo Leon, where Belandier collected, I cannot determine now. In 1857 Agassiz described the Texas Tortoise from Brownsville as *Xerobates berlandieri* (now known as *Gopherus berlandieri*). This tortoise was given a manuscript name by Berlandier though it is unlikely that Agassiz ever saw the manuscript of the *Journey*: (p 468):

"Two species of terrestrial turtles were found in those lowlying regions, and they are common on both banks of the Rio Bravo. One of them (*Testudo tuberculata* B. mss.) is remarkable for two rounded tubercles under the neck. It often serves as food for the military of the presidios when they travel in the wilderness. The other species of these turtles, which I have designated as *Testudo bicolor*, is very small and, like the preceding has at the anterior part

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of the plastron two teeth, or prolongations. These are so long in the tuberculose turtle that they serve to support its neck and head."

Besides "some twelve square feet of insects nicely preserved in glass cases" delivered to the Smithsonian, the "Catalogue of Insects contenus dans le caisson D. M. No. 3" received at Geneva by de Candolle, and which I examined in April 1955, listed 566 insects taken in Texas with notes on food habits. As with a chrysalis this information may yet emerge. It has, however, been Berlandier's plant specimens that have raised the furor. The story of his "monumental work for botany in early Texas and in Mexico" has been told by Professor Samuel Wood Geiser with full documentation in his "defense" of Berlandier published in *Southwest Review* in 1933. Geiser faithfully related how de Candolle "stigmatized Berlandier as a malcontent and an ingrate," and how Asa Gray defamed his character without full knowledge and even less appreciation of the circumstances attending Berlandier's mission.

In the introduction to this present translation Professor C. H. Muller has deftly and fairly considered the misbegotten verdict of Berlandier's place in Southwestern botany: "Ignored for a century, Berlandier still has lost little of his botanical significance. His [2,351] collections hold priority throughout hundreds of thousands of square miles of Texas and Mexico." With the documents before him Muller concludes that "we are far from a solution to the problem of who wronged whom." Muller then proceeds to comment on some "likely causes of trouble." Berlandier who has "so recently come from poverty and obscurity" might have been excused "for dreaming himself a second Humboldt: the tragedy was that he half believed it." He continued to send dried plant specimens to de Candolle at Geneva even eighteen months after his contract had expired. That he gave manuscript names to the plants he discovered was not a breach of contract, merely the human aspiration some glory might be his. Knowledgeable collectors had done as much: Joseph Banks on Cook's First Voyage, Frederick Pursh on his tours for Professor Barton, and David Douglas when he was ransacking the Oregon forests for the Horticultural Society of London. The sting came when Asa Gray, avaricious on occasion (as when he suppressed J. L. Riddell's Louisiana publication intended for the Smithsonian) and jealous of his supremacy in American systematic botany, detected that Berlandier had *published* a few of his novelties from Texas as early as 1832. This, in Gray's estimate, was first an infringement of the rights of de Candolle who was then writing the *Prodromus* accounts and then a nettling annoyance in the completion of his own *Synoptical Flora of North America.* Gray had met the elder de Candolle and his son Alphonse at Geneva in 1839, and considered them "his most important acquaintances on the Continent." Surely it was his regard for them that, as Gray's biographer, A. Hunter Dupree re-

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marked, Gray considered Berlandier "a dishonest knave." Muller explains Gray's misunderstanding of Berlandier's numbering scheme which in fact carried no intent to deceive. General Teran's wish to establish a museum of natural history for Mexico did not materialize. Berlandier had retained a duplicate set for the museum. Gray passed judgement concerning the allotment he had sent to Geneva in his letter to de Candolle May 29, 1855, preserved in the archives of the Conservatoire Botanique: "After all they will contain little that will be new for you: for Berlandier I find was so dishonest as to divide his collection of any given species, made all on the same day into 2, 3 sometimes even 4 or 5 portions, which he sent to Geneva at different times and under different numbers. And he also gathered the same species at different times and places so that the same thing occurs over and over, e.g. *Indigofera leptosepala* 425, 622, 1002, 1445, 2432 *Karwinskia humboldtiana* 162, 421, 689, 706, 820, 889, 2340, 2359."

After the death in 1863 of the Kentucky botanist Dr. Charles Wilkins Short, whom Gray considered "one of my most valued friends," Gray wrote to W. J. Hooker that Short and William Darlington "were both hearty and true Christian gentlemen." Short had purchased Berlandier's plant specimens for $400 when the Smithsonian had declined them. Gray had agreed to identify and distribute sets to botanists. In a letter from Gray to Short, dated December 26, 1854, at the Academy of Natural Sciences at Philadelphia, he wrote that Berlandier's collections "from 1800 down to 940" had been meagre and superlatively wretched! To get them out of the way I have already dispatched to Hooker, Engelmann & Torrey the portions destined for them down to 1800. How shall I send yours? Gray wrote again on July 5, 1855, that he was sending "a specimen (poor, but do not despise it) of a plant I found among Berlandier's rubbish, which proves to be a very distinct new genus which I have just characterized, naming it [not after its discoverer, but] after Ravenel of S. Car[olina]."

"On balance," writes Muller, "the impatience of A. P. de Candolle, the less than fair filial loyalty of Alphonse de Candolle, the divided loyalties and self-serving pretensions of Berlandier, the self-righteous sermons of C. W. Short [quoted by Muller], and the arrogant attacks of Asa Gray, one is tempted to conclude that these characters thoroughly deserved one another."

But what does Berlandier's *Journal*, now available for the first time, offer? Among hundreds of topics, vignettes of persons and places. For example, of Austin we read (p. 321):

> "Some days after our arrival the founder of the colony, Mr. Stephen Austin, arrived—an enterprising man endowed with a wily policy as well as a great deal of talent. That colonist always knew how to conduct himself to lull authorities to sleep, and they opened their shortsighted eyes only when the

colony had taken on a progress difficult to halt. From his instructive conversation we learned several details of the geography of Texas, for at that time he had already gathered the materials which served him for publishing the map of that department, the only one which up to this day can give an idea of Texas."

Of changes in the lower Mississippi Berlandier wrote:

"Balise—a sort of small fort erected about 1752—by 1770 had become one mile removed from the estuary of the river because of the formation of alluvial deposits. It has been calculated, going by the fact, that the earth gains about two leagues over the sea in one hundred years, and that consequently a cypress found close to New Orleans at a depth of twenty feet must have been buried about twelve centuries ago. I have a shell covered with a figwort that was found close to one hundred feet down in a wall being dug on the banks of Lake Pontchartrain. The depth would make the epoch in which it was buried date back to more than five or six thousand years."

He described New Orleans (p. 401):

"The port is magnificent. Sometimes one can see floating there more than five or six hundred ships from all the civilized nations of Europe and the New World. Frigates, corvettes, and the smallest ships go up the waterway without danger . . . The aspect of those ambulatory houses creates an especial waterscape when they are seen going in every direction over the waves."

Berlandier left New Orleans May 8, 1829 to return to Texas where, for the ethnographer he has left portraits of, among others, the "Tancahueses" (p. 312) the Tonkawas:

"The women, and in particular the oldest ones, were the busiest. Some tanned hides; others were cleaning a recently killed animal; others built cabins, etc.; in a word, activity prevailed, except among the men. . . . The women, much busier, are much dirtier." A watercolor of the Tonkawa Indians southeast of San Antonio, by a member of the expedition, but supervised and labeled by Berlandier, was included in Ewer's *Indians of Texas in 1830* (plate 5).

The Mullers' natural history notes are especially rewarding. And all are documented with in-place footnotes by specialists. Muller's familiarity with the countryside is abundantly shown. For example, in a passage describing the vegetation between Tampico and Matamoros (p. 503), the veteran oaks are reported as long since cut but that juveniles are abundant today. Berlandier observed that between Matamoros and Santa Teresa, Tamaulipas (p. 468) that "in the midst of flooded grazing lands, the ants—surprised by the water—clustered in balls and thus supported themselves en masse without drowning—for several days and often for several weeks—until the water receded. The tarantulas, also surprised in their burrows by the inundation, were perched on the tips of ligneous plants, where they had lived as prisoners for a long time."

It would be difficult to imagine a certain contemporary of Berlandier, a Harvard botany professor, sampling a meal described (p. 351):

> "At supper time we ate a small digitigrade carnivore known in the country as the zorillo, which is a species of skunk . . . they remove the anal glands and, having burned the hair, they cook it over coals. Despite tht repugnance which I then had for that food, I was very soon convinced to the contrary, and I believed myself to be eating suckling pig."

Rattlesnakes, to no surprise, were "extremely common . . . there are so many that it is difficult to take one hundred paces on the highway without finding one of these venomous reptiles or, at least, traces of it." Remedies are noticed (p. 459):

> "After one is bitten, he must drink the bile from the liver of the snake, mixed with a little water, which will preserve him from all the consequences of the bite."

Laurence Klauber in his two volumes, *The Rattlesnake*, mentions John Josselyn's note in *New England Rarities Discovered* (1672)! that bruised liver was to be applied to the serpent's bite. Berlandier concludes, "Lastly, the peasants have observed that tobacco intoxicates that viper or puts it to sleep (ordinarily at night it scarcely moves at all). Thus, in order to avoid an encounter, they place their tobacco a certain distance off: the viper, they say, is attracted by its odor, arrives at once, becomes inebriated, and stays there until the next day." Yes, there is the rope—this time black to simulate the rattler's "cruelest enemy" the black snake—to be laid outside the reposing traveler.

Berlandier referred to Michaux's *Flora* (p. 330, etc.) but did not mention Claude Robin's account of the Louisiana flora which comments on medicinal properties. He noted that the castor oil plant (*Ricinus communis*), introduced from Africa, always grew as an escape at no great distance from the dwellings of Man. Some ironies of priority include Drummond's phlox first collected by Berlandier, but described from subsequent gatherings of Thomas Drummond. "*Zygophyllum resinosum*" was Berlandier's apt name for the creosote bush which he first encountered in the vicinity of San Luis Potosi. John Torrey penned his identification on two of Berlandier's plates, as "Sarcostemma" and "Echinodorus rostratus var." confirming that Torrey not only had specimens but saw the plates.

Only two of Berlandier's bird drawings have been included in this work—zoologists may wish for more. "Cassicus niger" perhaps a misreading of the ms. for *Cassidix*, a name established by Lesson for the Boat-tailed grackle—is identified as perhaps the bird *C. mexicanus* (Gmelin) or the Common grackle, *Quiscalus quiscula* (Linn.). The Western meadowlark appears on the same plate (opp. p. 72) labelled "Sturnella hypocrepis var—S. torquata" by Berlandier. That Audubon named the meadowlark *Sturnella neglecta* in his *Birds of America* in 1844 only emphasizes the 'neglect' of Berlandier's novelties.

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Berlandier had noted two birds on his arrival at Panuco near Tampico (p. 33): the roseate spoonbill and "scissor-bill", certainly his name for the Black Skimmer. When he reports "cedro" as used for pirogues, could he have meant the Bald cypress, well known for that use in Louisiana? On the other hand he associated the binomial *Taxodium distichum* with "sabino" later in his journal (p. 584). What has been determined as pecan (p. 324) may have been the Bitter pecan, *Carya aquatica* (Michx. f.) Nutt. According to the records in Geneva Berlandier collected ten numbers (1937-1946) on the banks of the Mississippi River at New Orleans. Two of these are represented in the British Museum (Natural History) collections, but both are numbered "1946:" "Calliopsis cardaminaefolia DC." [Coreopsis cardaminaefolia (DC.) Nutt.] and "Senecio mississippiensis DC" [*S. glabellus* Poir.]

For all the fresh commentary on old Texas that Berlandier offers in this *Journey* there lingers a sadness. Sadness that debilitating malaria, abortive planning, and human frailties destroyed the full and faithful reporting of the first scientific fieldwork in what was then the northern reaches of Mexico. Opportunistic to the point of overstepping canons of friendship, Berlandier left a shadowed portrait. This posse has placed him in fine considered perspective.—*Joseph Ewan, Ida Richardson Prof. of Botany, Emeritus, Tulane University, New Orleans, LA 70118.*

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